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THE COUNTRY'S HELPLESS CONDITION.

In response to an inquiry from Senator Gallinger, of New Hampshire, chairman of the Merchant Marine Commission, Secretary Taft, of the war department, gives the startling information that the force which the United States military establishment maintains cannot be exerted over seas in case of a foreign war or for the defense of insular possessions, unless there is an immediate and great increase in the number of American steamships available for transport service.

"The quick first blow, so very and increasingly important," says the war department, "cannot be struck at all, nor can an expedition of any greater size be embarked without delay, except by the use of foreign vessels."

In war these foreign vessels cannot be acquired without evasion or infraction of the neutrality laws. Senator Gallinger's inquiry was sent to the war department in connection with the shipping bill of the Merchant Marine Commission, now being considered by the senate, one of the purposes of which, as expressed in the title, is "to promote the national defense." The reply of the war department has been prepared by a special committee of the general staff, and is transmitted to Secretary Taft by Lieut. Gen. Chaffee, chief of staff.

The report, which states that two sizes of merchant steamships are desirable for transport services, ships of 6,500 tons and of 5,500 tons gross register, vessels of medium dimensions, was presented by Senator Gallinger to the senate this week.

The speed which both the navy and war departments have determined upon as desirable for troop transport is a sustained sea rate of 12 knots.

"To make this speed with certainty and with economical coal consumption," says the report, "the ships should be designed for a trial speed slightly in excess of twelve knots." Steamships of 6,500 and of 5,500 tons are preferred because "it is conceded to be indispensable to the best results that each ship shall carry a tactical unit of troops with its complete equipment and supplies." This tactical unit is the infantry regiment or a battalion of engineers, a battalion of infantry and a squadron of cavalry. To provide suitable ships for a rapid movement of two divisions from either coast there should be not less than sixty of the larger and fifty-four of the smaller size afloat in the Atlantic and the same in the Pacific waters, or 120 of the larger and 108 of the smaller size in all, an aggregation of 228 vessels," the report says.

The report brings out the fact that no such fleet as would be needed for an overseas expedition could be furnished out of the present resources of the American merchant marine. "The official list of merchant vessels for 1904 shows fifty-seven sea-going ships of 4,000 gross tons and upward, with an aggregate tonnage of 400,000."

The report frankly characterizes the Santiago expedition of 1898 as a bit of sheer good luck. Every American vessel that could be obtained in the Atlantic ports during the twenty days following the declaration of war was chartered—a fleet of thirty-six vessels, averaging 2,500 tons, only two of them more than 4,000 tons. "The official records afford ample evidence that the safe arrival was due to the good fortune of continued fine weather," according to the report.

"A severe storm encountered would have scattered the fleet, probably with great loss of life, and would have defeated the object of the expedition." The report adds that "no cooking could be done on board ship, except to make coffee. Sanitary arrangements were crude and insufficient."

Looking to the future, the report declares: "This condition cannot improve until the American steam seagoing merchant marine has increased in tonnage to approximately two and one-half times its present volume, by the addition of ships adapted in size and design to quick conversion into suitable transports, and built under conditions which make their voluntary surrender to the United States on demand a foregone conclusion. So far as concerns the interests of military transports, any subvention, subsidy, or other assistance rendered by the United States to the American merchant marine will produce the greatest return for the money expended, if the legislation is so framed as to require, or strongly encourage, the construction of ships of the two sizes, and with the proportions and arrangements described in this report."

Senator Gallinger will inform the war department that ships of the size and speed described as most desirable for transports are also ships of the size and speed required for several of the most important mail lines provided for in the bill of the Merchant Marine Commission, which stipulates that ships receiving subventions from the government shall be held at the disposal of the government in time of war.

Recently an effort was made by the Harriman interests to purchase the Steamship Alameda, which has just come from the drydock where she has been undergoing needed repairs. The company mentioned wished to secure the Alameda to take the place of the lost St. Paul on the San Francisco-Portland route. However, the owners of the Alameda decline to part with that vessel, as she is very useful and profitable to them in the present route—San Francisco-Honolulu. Another reason why the Alameda is not just suited for the Portland run is because she draws a little too much water for the mouth of the Columbia river bar.

THE AMERICAN SHIPPING QUESTION.

BY COL. ROBERT J. LOWRY, PRESIDENT LOWRY NATIONAL BANK, ATLANTA, IN AMERICAN INDUSTRIES.

Much interest has been aroused throughout the country over the prominence given to American shipping at the convention of the American Bankers' Association, held in Washington. Secretary of the Treasury Shaw spoke most eloquently and forcibly, holding the rapt attention of his audience, who greeted his exposition of the subject with frequent and spirited applause. The succeeding day I presented a resolution which set forth succinctly the disadvantages under which our deep-sea shipping has long labored, called attention to the fact that a congressional commission (appointed upon President's Roosevelt's recommendation) had recently investigated it and rendered an elaborate report accompanied by a bill to carry into effect their recommendations, the resolutions declaring it to be the sense of the assembled bankers that the Commission's bill should be enacted by congress. Still, again, on the third day, the subject was discussed most learnedly and exhaustively by Mr. Harvey D. Goulder, a prominent Ohio attorney, who is president of the Merchant Marine League of the United States, an organization of patriotic citizens who are doing everything possible to secure greater publicity for American shipping needs, in order to hasten remedial congressional legislation.

When the most notable gathering of bankers ever assembled in the United States, and, happily, at the national capital, gives such unusual and all the more significant consideration to this industry, its signal importance is one unquestionably deserving of clearer understanding. To no class of American citizens should the necessities of our deep-sea shipping appeal with greater force than to manufacturers. It is gratifying to recall that the National Association of Manufacturers has for years in its annual conventions expressed itself with equal force and friendliness in behalf of adequate protection for our deep-sea shipping through congressional action. At the last convention, held at Atlanta, the National Association went on record with practical unanimity in favor of the bill presented at the last session by the Merchant Marine Commission, and calling upon congress for its enactment. Other national organizations in recent years have taken similar action, as have state legislatures and other public bodies.

The first act of the first congress, in 1789, was a protective tariff enactment. In addition to the encouragement given to our manufactures protection was given to our shipping by providing that goods imported in American vessels should pay a less duty than goods imported in foreign ships. So great a reduction was thus effected in our customs receipts through the rapid growth of American shipping, that the law was changed so as to increase the duty on imports in foreign above the duties exacted on imports in American vessels. During succeeding years much attention was given by successive congresses to our marine, with the result that it became, and for years remained, one of the most vigorous and prosperous, if not the most profitable, of all of our national industries. The instrumentality of the tariff was then used for the protection of our shipping just as it then was and still is used for the protection of such of our industries as are subject to foreign competition. So strong, indeed, did our navigation interests become, that it was believed that protection was no longer needed, with the result that we gradually abandoned our protective shipping policy, beginning with the treaty concluded after the war of 1812-15. During the period when our navigation laws were in unimpaired vigor our ships carried 90 percent of our imports and exports. Nearly a century ago our deep-sea shipping was larger than it is today, and in 1801 it was three times greater than it is now.

In an evil day, as has been said, our shipping protection was withdrawn. Worst of all, we have successively bound ourselves by commercial treaties, numbering now in excess of thirty and in force with as many different nations, not again to discriminate in favor of our own ships through the tariff. These treaties, therefore, act as a barrier to the protection of our ocean shipping under the early-day policy, and their abrogration so as to permit of its readoption is regarded by practical statesmen as too huge a task to be undertaken. Moreover, we have a free list nowadays that is as large as our dutiable list, and the suggestion of placing a duty upon our non-dutiable imports, even temporarily, although confined to imports in foreign vessels, is repugnant to many of our statesmen.

So our shipping has remained unprotected during all of the years of high protection, with the result that we now carry but 9 or 10 percent of foreign commerce. We have free trade between American and foreign ships in the carriage of our imports and exports. The consequence has been that our ships have all but been effaced from the seas. Free traders say that protection has ruined our shipping. In 1792 a law was passed denying American registry to foreign-built vessels. This is what free traders base their assertion upon that our shipping has been ruined by protection. But that act was in force when our ships carried 90 percent of our imports and exports, just the same as it is now. Our ships were protected then; they are not now.

A cargo of English manufactures, we will say, is shipped from London to the United States. Those manufactures may bear an average duty of 50 percent of their value, in order to compete with similar American manufactures. But the foreign ship that brings the cargo is permitted to engage in free trade competition with the American ship that seeks the cargo. Now, the American ship is a manufacture, but it has no protection whatever against the foreign ship in the carriage of our imports or exports. The same causes that necessitate protection for our manufactures necessitate protection for our ships. The lack of it has ruined our shipping. Let one of our manufacturers whose product is protected by our tariff imagine himself deprived of all protection, and his product subjected to the free trade competition of his foreign rivals, and he will at once realize the plight of our shipowners. Moreover, he will realize very clearly indeed how it is that our deep-sea shipping has been ruined.

In the greatest abundance we possess all of the materials needed for building ships; we have skilled designers and mechanics to build them; we have a commerce to carry that constantly employs 6,000,000 tons of ships, to build which would require an expenditure exceeding $600,000,000, the annual additions to which would cause an expenditure of from $50,000,000 to $75,000,000, giving employment to many thousands of our citizens ashore and afloat, and enabling us to keep the $200,000,000 in ocean freight charges that it is now conservatively estimated we annually pay over to foreign shipowners.

It is to remedy this condition that the agitation in behalf of American shipping has been so insistent and so persistent. This agitation has taken on increased force throughout the nation, compelling congress to investigate. The result is a bill, prepared by this commission, that will establish a dozen different new steamship lines running to West Indian, Central and South American, African and Oriental countries, and so encourage the construction and operation of cargo vessels, sail and steam, as to give our people a chance to wrest a large portion of the carrying from our foreign rivals that they now enjoy. It is proposed to do this by paying to mail steamships subsidies sufficient to cause the establishment of lines, but these subsidies will be returned to the government in the sea postage it receives from

those sending letters abroad. The bounty for cargo vessels it is proposed to secure from tonnage taxes, the burden of which will fall most heavily upon our foreign rivals; so that practically no expense is saddled upon the people or the government as a whole to protect our ships. Those best able to judge say that the passage of this bill will give a great and long-sustained impetus to shipbuilding for our foreign trade.

Right here the sole remaining difficulty arises, namely, a division among our people as to the best method to adopt to restore our ships to the seas. It need not surprise anyone to learn that this division is aided and abetted by the foreign shipping interests that have the annual $200,000,000 freight rates at stake; so long as it is effective, it is their salvation. their protection in the enjoyment of our foreign carrying. The division is one purely of free trade against protection. The free traders would solve the problem by having foreign built vessels owned by our citizens admitted to American registry. This is the plan favored by foreign shipping interests; it is the plan advocated by their defenders and advocates at home and abroad. It is, therefore, the plan for us to avoid. Protectionists advocate direct government aid by subsidies and bounties, so adjusted as to enable our builders and owners to overcome the differences in construction and operation cost in competition with foreigners. Having deprived ourselves by treaty engagements of a resort to the tariff as the instrumentality with which to protect and encourage our shipping, we must adopt the next best plan, that of direct aid; it is the plan which other nations possessing a shipping have adopted, and with which they have succeeded. It is the one that will cause the least friction and that will be most effective. It is presented in the commission's bill, a measure which President Roosevelt is quoted as having warmly commended in its general terms, and which, if passed, he would undoubtedly very gladly sign. It is a bill that is favored by a number of Democrats and practically all of the Republicans in congress; it is nonpartisan and non-political, fair and just. It is precisely what is needed, and which the signs of the times indicate will be placed upon our statutes before the adjournment of the next session of congress.

Other governments think it pays; and it does pay. Our neglect places the carrying of our foreign commerce at the disposal of our foreign rivals; it gives them the means, at our expense, with which to build ships, and to educate and train their officers and seamen. Where they are strong, through our neglect, we are weak, and the nation may be imperiled, disaster may come, overwhelming and irretrievable, unless the remedy is applied. The remedy has been prepared; it rests with congress and President Roosevelt to apply it.

AFFAIRS AT TONAWANDA.

North Tonawanda, Jan. 17.—The Niagara Transit Co. of this city, owner of the big freighter William A. Rogers, which arrived at Buffalo last December with the largest cargo of grain ever floated on the great lakes, held its annual meeting here last week and elected Charles Weston of Buffalo as president; LeGrand S. DeGraff of North Tonawanda, vice president and William M. Mills of Tonawanda as secretary and treasurer. Mr. Mills was also elected as manager of the freighter W. A. Rogers during 1906.

Capt. G. W. Honner of Grand Haven, Mich., who was master of the iron ore carrier Fleetwood of the Tonawanda Iron & Steel Co.'s fleet of North Tonawanda last season was appointed on Monday as master of the freighter William A. Rogers to succeed Capt. F. Derringer of North Tonawanda. Capt. Derringer will continue in the employ of the Niagara Transit Co. and will supervise the construction of the mammoth freighter building by the American Ship Building Co., which will be known as the Charles Weston of North Tonawanda. The Weston will be built for the Tonawanda Transit Co.

The last vessel to come down the Niagara river this winter was the propeller Veronica, which has been undergoing repairs at the Buffalo dry dock. The Veronica came down last Monday afternoon and tied at the local ore docks. The propeller Fleetwood came down the Niagara river last Saturday afternoon and also laid up here for the winter. There are now fifty-four vessels in ordinary at the Tonawanda ports.

LAUNCH OF STEAMER E. D. CARTER.

The steel freighter E. D. Carter was launched from the Wyandotte yard of the American Ship Building Co. on Saturday last and was named by Miss Isabel Hunter of Erie in honor of Mr. E. D. Carter of Erie. The launching party came in a special car from Erie and was one of the largest that has attended a launch at this yard in several months. The new steamer is a duplicate of the Leonard C. Hanna and will carry 9,000 tons on present draught. She is 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep. Her engines are triple expansion with cylinders 22½, 36 and 60 in. diameters by 42 in. stroke, supplied with steam from two Scotch boilers, 18 ft. 9 in. diameter by 11½ ft. long, allowed 180 lbs. pressure.

Capt. C. H. Wilson, of Erie, who was in the steamer Luzon last season, will sail the Carter. On the launching stand were: Mr. and Mrs. E. D. Carter, Miss Isabel Hunter, Miss Grace Richardson, Mrs. J. Edgett of Erie; Mrs. Thomas Shannon of Little Rock, Ark.; Mrs. Fred Bacon of Los Angeles, Cal.; Capt. C. H. Wilson, Wm. Hartwick, Frank Connell, Prof. H. C. Missimer, R. W. Walker, R. J. Moorhead, F. H. Lee, R. P. Lowry, J. A. Lemmon, Charles Messenkopf, H. T. Jarecki, H. C. Kelsey, W. C. Beers, George T. Bliss, Harry L. Moore, D. W. Harper, C. E. Shenk, Isaac Baker and Edward Mehl of Erie; Capt. John Mitchell and Ralph Mitchell of Cleveland; Capt. J. J. H. Brown and Hiram Smith of Buffalo; Tom Prindiville and Wm. Preston of Chicago; L. A. Stewart of Toronto.

LUMBER CARRIERS' ASSOCIATION.

The annual meeting of the Lumber Carriers' Association was held in Detroit last week. Officers were elected as follows: President, J. A. Calbick, Chicago; vice presidents, W. H. Teare of Cleveland, O. W. Blodgett of Bay City and W. D. Hamilton of Chicago; secretary-treasurer, H. E. Rünnels, Port Huron. The report of the retiring president, Edward Hines, showed the association to be in satisfactory condition. The association adjourned without taking any definite action with relation to the wage scale. This question will be discussed by the board of managers at its meeting on Feb. 6th. It is understood that owners of about seventy-five vessels, representing about one-third of the tonnage of the association, have signed an agreement to place their boats in the hands of a chartering committee. This chartering committee will have full charge of all vessels under the general direction of the board of managers. The chartering plan, however, will not become effective until three-fourths of the members enter into it.

The Hector Submarine & Propeller Co., 558 Broad street, Newark, N. J., was incorporated last week with a capital of $100,000 to manufacture and repair submarine boats. The incorporators are: Andrew Hector, East Newark, N. J.; Ludwigg G. Margett, Newark, N. J., and John Raid, Kearny, N. J.

BRITISH SHIP BUILDING RETURNS.

Liverpool, Jan. 8.—The returns of ship building throughout the United Kingdom are now complete, and disclose record figures, while the tonnage now in course of construction is probably greater than at any former period. In private yards the output has been 1,698,152 tons, as against 1,348,533 in 1904; while British Royal dock yards have turned out 46,250 tons compared with 57,100 tons in the previous year. The various ship building centers have contributed to this total as follows: The Clyde and Scotland, 407 ships of 571,287 tons; the Tyne, 135 ships of 322,749 tons; the Wear, 101 ships of 316,940 tons; the Hartlepools, 35 ships of 119,517 tons: the Tees, 40 ships of 132,751 tons; the Humber, 108 ships of 29,497 tons; the Thames 138 ships of 12,398 tons, the Channel and West Coast, 192 ships of 48,270 tons and Ireland 35 ships of 144,743 tons, which with the 46,250 tons built in Royal dock yards makes a grand total of 1,744,402 tons, an increase over 1904 of 338,769 tons. The ships turned out during the year 1904 showed a decrease compared with 1903 equal to 2 per cent. The figures for 1905 on the other hand show an increase on 1904 equal to 24 per cent. The year 1905 opened with a very widespread feeling amongst ship owners that prices for new tonnage were at their lowest, and as freights were low and no indication of an early advance, it was desirable from the ship owner's point of view to contract with as distant delivery as possible, consequently, within the first six weeks of the year, a large amount of work was placed. After this, comparatively few contracts were placed until the beginning of September, when, after the conclusion of the war between Russia and Japan, prices of material began to advance, which induced many owners to contract freely, with the result that at the present time there is a record amount of orders in hand. The past year's production has included the Hamburg-American Line steamer Kaiserin Agusta Victoria, of 26,000 tons gross register; built in Germany, the same company's steamer Amerika, built in Belfast, of 23,000 tons, the Cunard company's turbine steamer Carmania, of 20,000 tons, and many other steamers over 10,000 tons. A striking expansion of the British mercantile marine of late years is shown in the fact that there are now afloat about 100 steamers of from 10,000 tons to 26,000 tons gross register, of which about one-half are British. In all the "boom" of new vessels ordered and built during last year, it is evident that the day of the sailing ship is fast passing away. Another noteworthy feature of the year is that turbine machinery has been successfully tested during the past year in long voyage service, and appears to have confirmed the favorable results previously obtained on short services, of economy, speed, and increased stability. It should also be noted that the construction of the turret-deck type of ship has largely increased, although still built only by the Sunderland firm of Messrs. Doxford, who have the largest output of tonnage of any builders for the past year.

It is true that other ship building nations build ships of the highest type. The Kaiserin Agusta Victoria now on the stocks at the Vulcan company's Stettin establishment, is to be a second Baltic to that built by Messrs. Harland & Wolff for the White Star Line, with the same displacement, namely 40,000 tons, but exceeding the White Star boat in gross tonnage by 1,000 tons. She is an admirably well designed boat of the moderate speed of 17½ knots, and it is anticipated that she will prove satisfactory to the shareholders. She will ply between New York, Plymouth and Cherbourg. In the United States there is at this time not a single merchantman intended for the oversea trade on the stocks in any of the yards; but the Dakota, with her 37,000 tons displacement was launched last year, and this fact is mentioned because she is the largest vessel ever built in the United States. Other nations have turned out creditable merchantmen, but they are compared with the British output, what must be described as isolated cases, making but a small aggregate of tonnage of the first class. Not one of all these for example, has been fitted up with the turbine, the engine of the future. British yards, on the other hand, have engined the Victorian, and the Virginian for the Allan Line, with turbines, and for the Cunard company the Carmania, the speed trials of which vessel, compared with those of the Caronia, working reciprocating engines, have fully demonstrated the superiority of the turbine for high-speed ships. Britain has also built turbine vessels for the cross channel and excursion services, including the Queen, with a speed of about 22 knots. The Brighton of 21.5 knots, the Londonderry with 22.3 knots, the Manxman with 23.14 knots; the Viking with 23.53 knots; the Princess Elizabeth with 24 knots; and many more constituting a veritable fleet of turbined boats, and demonstrating in nearly all cases that the speed is greater than that contracted for. The new Cunarders, also now in course of construction on the Tyne and Clyde, and soon to be launched, will each have turbines equal to 65,000 H. P., with a speed of 25 knots.

In marine engineering, the combination of Richardson Westgarth, Ltd. at Middlesborough and Hartlepool has turned out 41 engines of 124,350 I. H. P. which is the largest horsepower ever returned by any British engineering firm, while the total output of engines during 1905 representative of the entire country overtops all previous records. In the number of engines, the North-Eastern Marine Engineering Co. has gone one better, having turned out from its Wallsend and Sunderland works no fewer than 57 sets of marine engines, but their united indicated horsepower falls somewhat short of that of the Tees-side combination, amounting to 104,095 I. H. P. Another northeast coast firm which reports a heavy year's work is the Wallsend Slipway and Engineering Co., Ltd., which has constructed 21 sets of engines, of varying size and power with a total indicated horsepower of 90,860. This company of late years has invariably done some admiralty work, and 1905 is no exception. The output including the powerful engines of 23,500 I. H. P. for H. M. S. Warrior building at Pembroke dock yard, while the boiler installations include the boilers for the Isle of Man turbine steamer Viking, and those for the channel passenger boats Sussex, Columbia and Alma. For the next largest output the name of Messrs. Harland & Wolff of Belfast appears, who have supplied the engines for nine huge vessels they have built, together with the machinery for H. M. battleship Hibernia of 18,000 I. H. P., the whole making up a total of 72,031 I. H. P. This includes the powerful engines for the monster Hamburg American liner Amerika, of 22,724 gross register tons and 15,120 I. H. P. At Barrow in Furness, Messrs. Vickers Sons and Maxim, Ltd., have constructed the engines for the armored cruiser Natal, for the big Japanese battleship Katori, the training-ship Plymouth and the scout skirmisher which together have a total I. H. P. of 64,900. On the Clyde, the Fairfield company report a machinery output of 56,150 I. H. P., made up of six sets of engines, including the powerful machinery for H. M. S. Cochrane, the turbine channel steamer Dieppe, the Hamburg liner Fuerst Bismarck and the Canadian Pacific Railway company's steamer Empress of Britain. Messrs. Blair & Co., of Stockton, closely follow the Fairfield company, 35 sets of marine engines totaling 55,150 I. H. P. and Messrs. George Clark & Co., Ltd., of Sunderland, come next with 28 sets of engines of 53,650 I. H. P. The return of the Parsons Company, of Wallsend, is interesting in that it shows the further progress made by the steam turbine, nine vessels having been engined with this type of machinery, totaling 50,000 I. H. P.; the largest amount of turbine power so far turned out in one year. Next come John Brown & Co., of Clydebank, whose

return is also interesting in that it includes the high speed turbine engines of the now famous Carmania, and the powerful machinery for H. M. S. Africa, besides two fast paddle steamers. Messrs. Workman, Clark & Co., of Belfast, have engined the 12 vessels they have built, their united horsepower amounted to 44,250. The Central Marine Engine works, of West Hartlepool, have engined 18 cargo steamers with a total power of 34,150 I. H. P. The above are the leading British firms whose output calls for notice:

The Liverpool Underwriters' Association have just issued their usual statements dealing with the casualties to vessels of 500 tons and upwards during the month ending December 31, and for the year ending with the same date. The first return shows that during December there were totally lost 34 vessels of 67,107 tons gross, compared with 23 vessels of 42,651 tons in December, 1904. These were divided as under:—British, 4 sailers of 7.096 tons (compared with 3 of 5,236 tons), and 8 steamers of 12,467 tons (against 8 steamers of 21,428 tons); and foreign, 1 sailer of 539 tons (against 5 of 4,647 tons) and 21 steamers of 47,005 tons (compared with 7 of 11,340 tons). The partial losses during the month totalled 599, compared with 623 in December of last year. These included 13 British sailers (compared with 29) and 279 British steamers (compared with 287), and 27 foreign sailers (against 43) and 280 foreign steamers (against 264). The chief causes of disaster were:—Strandings, 205; collisions, 201; weather damage, 112; damage to machinery, propellers or shafts, 70; fires and explosions, 24.

The total losses during the whole year totalled 294 vessels of 517,689 tons gross, compared with 225 vessels of 379,300 tons in 1904. These included 30 British sailers of 48,016 tons, (against 29 of 41,862 tons) and 60 British steamers of 138,547 tons (against 57 of 138,064 tons) and 72 foreign sailers of 77,293 tons (compared with 54 of 59,189 tons) and 132 foreign steamers of 253,883 tons, against 85 of 140,185 tons. Among the causes of disaster one item stands out by itself. This is the fact that no fewer than 31 vessels have mysteriously disappeared with all on board, and the total loss of life through this class of disaster alone must represent about 1,000 souls. Of the missing vessels 17 were British and 14 foreign. Of last year's partial losses 1,556 were due to collisions, 1,448 to strandings, and 918 to weather damage.

The announcement is just made, which I have confirmation of, that the Pacific Steam Navigation Company, of Liverpool, has parted absolutely with its share in the Orient Pacific line to the Royal Mail Steam Packet Company. As is well known, the Orient Pacific is managed by Messrs. Anderson, Anderson & Co., and is engaged in the Australian trade, the fleet consisting of eight steamers, four owned by the Orient Co. and four by the Pacific Steam Navigation Co. The change now effected means that the four last mentioned steamers will be transferred to the Royal Mail Company, the service being in the future known as the Orient Royal Mail Line.

The motor barge Duchess, built by Messrs. Thornycroft is about to be used in a number of experiments on the chief canals of the country in connection with the development of motor traction on British inland waterways. Cargo will be placed on the vessel at various towns, and transported to its destination by the canal. The cost of loading and unloading cargo, the time occupied in transit between certain important points, the costs of propulsion, and the extent to which a self-propelled barge similiar to the Duchess and capable of carrying a considerable volume of freight should facilitate navigation. These and other important considerations will be carefully noted for future information and future guidance. The experiment is being watched with much interest.

The Canadian Pacific Railway Company, while catering for the Atlantic trade by building steamers of the Empress of Britain type, are pursuing their progressive measures also in connection with the Orient. According to mail advices, a leviathan that will rival in size and speed the greatest of the Atlantic steamships, will shortly be in course of construction at one of the Clyde ship yards, and when completed, she will be placed on the Pacific route. For some time the plans of this palatial vessel have been in the hands of the foreign freight department officials at Montreal, and had it not been that the Scotch ship building yards were overcrowded with business, the construction of the vessel would now be well advanced. The new steamer will have a combined freight and passenger capacity greater than any steamer now on the Pacific Ocean, and will compare favorably in capacity and appointments with the largest of the Atlantic liners. The construction of such a vessel is the result of the growing trade with the Orient and the economic conditions that prompt the C. P. R. Company to divert traffic across the Rocky Mountains. This was hinted at in Montreal circles when Mr. W. Whyte, manager of the Western Lines, reported on the growing cattle trade from Alberta to the Pacific Coast, and to the possibility of a large meat business with the Orient. At the same time, Mr. Whyte spoke of the enormous possibilities of red wheat growing on the irrigated lands of southern Alberta and indicated that much of this must ultimately find its way to the populous countries across the Pacific.

C. A. PARSONS ON TURBINE DEVELOPMENT.

The Hon. C. A. Parsons has just delivered an interesting lecture at the Armstrong College, Newcastle, on the initiation and development of the steam turbine as applied both to land and marine purposes.

Mr. Parsons said that the first turbine of which there was any record was that of Hero of Alexandria, about 130 B. C., which was a reaction engine; and the next was Brauca's paddle wheel, about 1629, impelled by a steam jet. The principles involved in these designs were practically indentical, and in neither of them could sufficient speed be obtained to afford reasonable economy.

The introduction of the modern steam turbine commenced in 1884, when a 10 horsepower turbine and dynamo, of the compound type, which enabled comparatively moderate speeds of rotation to be obtained, was constructed; and it was of this type that the greatest number of larger sized turbines for driving dynamos, and also for marine purposes, were constructed at the present time. The system was that of causing the steam to pass through a large number of turbines proportioned so as to to radialize the expansion of the steam, which went at a comparatively moderate velocity the course of its circuits—the course through the many turbines of the series,—just as water fell through a long series of rapids from a lake of higher level to one of lower level, the lake of higher level corresponding to the boiler and the one of lower level to the condenser. At first only a few turbine engines of small size were constructed, and these were carefully tested and sent out to work. This resulted in a gradual accumulation of experience and trade knowledge, so that in 1888 working plans were prepared for a turbine of the condensing type, which, it was expected, would realize an unprecedented economy in the use of steam. About this time, however, owing to the temporary loss of the patent rights, the parallel flow type of turbine, which had been manufactured up to that time, had to be given up, and the radical type was constructed in 1891, and in the following year, when tested connected to a condenser, was found to consume only 27 lb. of steam per kilowatt hour, which was equal to the performance of the best triple expansion engines of that day. In 1893 the patent rights were reacquired, allowing of a reversion to the original or parallel-flow type of turbine, and subsequent experience had shown that had the design of 1888 been constructed an

economy would have been obtained then 20 percent superior to that actually realized in 1892; and there was now no question but that the turbine in its present perfected and economical form would have come into general use about five years earlier both for land and marine work. Large sizes of turbines, continued Mr. Parsons, were constructed in subsequent years with greater economy. Recently at the Carville Station of the Newcastle Electric Supply Co., 15.4 lb. of steam per kilowatt hour had been obtained when generating 4,000 kilowatts. Why, it might be asked, was the turbine more economical than the reciprocating engines? The answer was that the turbine was able to expand the steam fully and economically from the boiler pressure, right down to the condenser pressure, while the reciprocating engine was unable to expand it the whole way. As a matter of fact it could only expand it usefully about two-thirds of the way. At the present time turbines were constructed up to 5,000 kilowatts, or about 8,000 horsepower. There were at Carville several having a normal output of 6,000 horsepower at 1,200 revolutions per minute; and these were capable of developing upwards of 10,000 horsepower when overloaded for some considerable period. Turbines of similar size and design had been constructed by Messrs. Brown, Boveri, of Baden in Switzerland; while they had several under manufacture of 12,000 horsepower normal output.

As regarded marine development, the attack on this field of work was more difficult than in the case of the land turbine, chiefly because of the older and more matured state of marine engineering as compared with electrical, marine engineering having been the growth of more than three-quarters of a century. It was decided in 1894, to build an experimental vessel, the Turbinia, which should be adapted to prove and develop the merits of the system. After several alterations, due to unexpected difficulties, the Turbinia was completed in 1897, and when tested by experts, was found to be most economical, and at the same time to have unprecedented speed. On account of the successful results of the Turbinia, two torpedo-boat destroyers, the Viper and Cobra, were engined, and they on trial proved most satisfactory. But, unfortunately, owing to no fault of the turbine engines, they were both lost at sea. After the loss of these vessels, it was apparent that unless something exceptional was done there was a danger of the entire enterprise collapsing; and it was realized that a special effort was necessary to start a new development of the system in the mercantile marine. A combination was, therefore, formed between Captain John Williamson and Messrs. Denny of the Clyde, and the Turbinia Company of the Tyne, which resulted in the building of the first mercantile turbine vessel, the King Edward, in the spring of 1901. She was a great success, beating all the other boats on the Clyde, both in steam and economy of coal consumption, and during the five years she had been in commission there had been no deterioration in economy as in speed, and there had been no expenditure in the maintenance of the engines. The Queen Alexandra was built in the following year, being similar in design, but slightly larger and these two vessels paved the way to the long list of similar vessels, the cross-channel boats, commencing with the Queen for the South-eastern and Chatham Railway Company between Dover and Calais. Of this class of vessel, 12 were now in service, and six were building. These vessels had been found both to reduce the time of crossing, especially in bad weather, and to effect a saving of from 15 to 25 percent of coal, as compared with similar vessels. The third-class cruiser Amethyst was engined with turbines, and three other identical vessels were built at the same time by the Admiralty and engined with triple-expansion engines of the usual type. Careful tests were made between the Amethyst with her turbine engines and the vessels with reciprocating engines, the result being that at all speeds above two-thirds of the full speed the turbine was the most economical, and at full speed the turbine developed 42 per cent more power than the reciprocating engines on the coal that was allowed. The result was that the turbine vessel had at 20 knots a radius of 3,600 nautical miles, while her sister vessels with reciprocating engines could steam only 2,000 miles at the same speed.

A couple of years ago, when it was decided by the Cunard Line to build two great express liners of 24½ knots for Atlantic service, a committee was appointed by the late Lord Inverclyde to consider the question whether turbine or reciprocating engines should be adopted. This committee was composed of representatives from the Admiralty, Lloyds, and the leading ship building and engineering firms and naval architects of the country. The inquiry resulted in the recommendation of turbines for these large express Cunarders which would have a horsepower of 60,000 to 70,000 each; and also for the intermediate Cunard liner Carmania of 20,000 tons and 23,000 horsepower which was to be a sister ship to the Caronia, having reciprocating engines. The Caronia underwent her trials last spring and attained a speed of about 19½ knots; and was considered to be one of the most highly equipped and most economical vessels ever built. She was fitted with twin screws, driven by quadruple-expansion engines of the most modern design. The Carmania was fitted with turbines manufactured by Messrs. John Brown & Co., at Clydebank, from the general designs of the Turbinia Company at Wallsend. She has three shafts, each with one propeller. The center shaft is driven by the high pressure turbine, and each of the side shafts by a low pressure turbine, all of the same design as the cross-channel boats, the Amethyst and others. The revolutions of all the shafts were about 180 per minute, and nothing had been left undone in either vessel that engineering skill and money could accomplish to obtain the best results. The trials of the Carmania were looked forward to with the greatest interest, as this was rightly considered a crucial test of the turbine system of propulsion for vessels of the largest size in the mercantile marine and the navy. The Carmania was on her trials about the middle of November, and the result had been that she had beaten the Caronia by about a knot. But this did not give an adequate idea of the relative advantages of the turbine as regarded coal consumption. It must be realized that one knot in speed meant about 16 per cent more horsepower, and that, therefore, the turbine boat was at least 16 per cent more economical than her sister vessel, driven by the most highly developed ordinary engines. Further than that, in regards to turbines generally, it must be remembered that the Carmania was the first example on so large a scale, and it might reasonably be expected that improvements in detail would still further increase the very excellent results which she had already realized. Of the great Cunarder expresses one was being built at Messrs. John Brown & Co.'s yard, Clydebank, while the hull of the other was being built by Messrs. Swan Hunter and Wigham Richardson, Ltd., and the engines by the Wallsend Slipway Company.

The battleship Oregon has been sent to the Puget Sound navy yard where she will remain the next two years undergoing a complete overhauling. Many parts of the ship are to be practically rebuilt, turrets are to be equipped with electric controlling apparatus and features which have become obsolete are to be replaced by the latest pattern.

NATIONAL RIVERS AND HARBORS CONGRESS.

To have a permanent annual congress for the purpose of concentrating interest in rivers and harbors of the nation, educating the people on the needs in that respect, and securing liberal appropriations for the development of the waterways and seaports is the purpose of the 250 delegates from twenty-six states, representing 110 commercial bodies, who attended the National Rivers and Harbors Congress at the Arlington Hotel, Washington, on Monday of this week.

The first congress was held four years ago at Baltimore, its purpose being to save from defeat the appropriation bill then before the national congress.

The address of Hon. T. E. Burton, chairman of the rivers and harbors committee of the house of representatives, was the feature of Monday's session. He stated that the policy of the congress should be consistent and uniform in order to secure the best general results, that no community should think it is the whole United States, but should remember that the committee has about 400 propositions on hand from which it must choose the most feasible bills.

He stated that while the improvement of the waterways was a great stimulus to commerce, the nation could not afford to give this problem more than its share of consideration. He said there is a lack of education on navigation, which he hoped would be overcome through the efforts of the rivers and harbors congress.

In reviewing the methods of the national congress, Mr. Burton said that circumstances must guide in these improvements. The municipalities and private corporations immediately benefited, he declared, should bear part of the burden.

He argued that a division of expenses would secure a most equitable adjustment. He said a considerable amount of money has been used on insignificant streams, and that more attention should be given to those needing the most attention, and less to those not ripe for improvement.

"The aggregate of estimates for improvements congress has been asked to make is about $300,000,000, and with an annual appropriation of not more than $25,000,000, the rivers and harbors committee finds the work of elimination its biggest task," he said.

"For the development of our trade nothing could be more helpful than judicious and generous provisions for river and harbor improvements. The United States is becoming more and more the purveyer of the world's wants, and to provide for the utilization of our magnificent advantages it is necessary to make traffic as cheap as possible."

Hon. Charles Scott, of Mississippi spoke against the policy of holding down the lid of the national treasury on such urgent needs as the improvement of transportation facilities. He referred to the great advancement in the commercial world the United States has made, and pointed out the possibilities of the future.

He said the work of bettering the waterways and harbors should go hand in hand with the Panama canal.

Albert Bettinger, of Ohio; Hon. Walter Gresham, of Texas; Congressman Dawson, of Iowa, and W. R. Kennett, were speakers at the afternoon session, all advocating the loose purse policy, and declaring that the greatest advancement of the nation depended upon the navigation and transportation facilities, which would open up stagnant enterprise, afford the farmers and miners a quicker market, and create more commercial competition locally.

Mr. Harvey D. Goulder, of Cleveland, was elected president of the congress. As a private citizen Mr. Goulder is probably the foremost figure in the country at present active in the improvement of water ways and no better selection as president could have been made. The committee on resolutions reported in favor of asking a $50,000,000 appropriation for projects endorsed by the government engineers. Capt. Wm. B. Rodgers, of Pittsburg, offered a resolution demanding a national bond issue of $200,000,000 to provide means for river and harbor improvements. Mr. Goulder felt that such a demand would only serve to stimulate opposition to the regular river and harbor improvements and would simply serve to defeat the very purposes for which this association was organized. He vigorously opposed the resolution and caused its defeat.

It is quite likely that the National Rivers and Harbors Congress will become a permanent organization with annual meetings. To bring this about an executive committee of 15 members was appointed. The significance of this congress will be more fully discussed in the next issue of the REVIEW.

PERSONAL.

Mr. C. J. Love has been appointed chief engineer of the steamer Joseph Sellwood of the Mitchell fleet.

Thomas W. Kennedy, superintendent of the grain and elevator interests of the Lake Carriers' Association at Buffalo, has been reappointed for 1906.

Beeche, Duval & Co., 25-33 Broad street, New York, announce that in consequence of impaired health, Mr. Solustio Beeche has ceased to be an active partner, and has become a special partner.

Edward A. Uhrig has been elected president of the Citizens' Business League of Milwaukee. He has also just been made a director of the First National Bank of Milwaukee and secretary, vice president and treasurer of the Milwaukee German Fire Insurance Co.

Mr. W. H. Smith has been appointed manager of the Canada Atlantic Transit Co., and Canada Atlantic Railway Barge Line in charge of the operation, maintenance of agents pertaining to the steamers and barges in the service of the company. His offices will be at 401-402 Board of Trade building, Montreal.

The Crandall Packing Co. of Palmyra, N. Y., have opened a store at No. 9 South Water St., Cleveland, O., and members of the engineering fraternity will find one of their old friends in charge, Mr. John M. Chapman, who for many years has been in charge of the Cleveland branch of the Garlock Packing Co.

Mr. Wm. T. Blunt, M. Am. Soc. C. E., who has been connected with government service the greater part of the time since 1879, and has been assistant engineer upon the harbor works in the Cleveland district on Lake Erie since 1886, has been given an indefinite furlough, and entered contract work at Boston, with Geo. H. Breymann & Bros., on Jan. 1, 1906.

Charles E. Newell, of Buffalo, N. Y., the newly elected first vice president of the International Brotherhood of Steam Shovel & Dredge Men, has been placed in full charge of the dredge business on the great lakes by the International Brotherhood of Steam Shovel and Dredge Men. Mr. Newell's headquarters will be at Buffalo and he will handle all agreements made between the dredge contractors' association on the great lakes and the International Brotherhood of Steam Shovel & Dredge Men. Mr. Newell at the present time is chief engineer on the largest fresh water dredge in the world which is owned by the Buffalo Dredging Co.

The Pusey & Jones Co., Wilmington, Del., launched a small vessel last week for the Waldon Rotary Engine Co., Philadelphia. The craft is 62 ft. long and 7½ ft. wide.

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

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The National Rivers and Harbors congress in session at Washington this week, has selected Mr. Harvey D. Goulder, of Cleveland, as its president. No worthier selection could have been made. There is probably no man in the country who has so completely devoted his life to maritime affairs as has Mr. Goulder. His whole life has been spent in defending and developing lake trade, and he is at present devoting a great deal of time to a purely gratuitous office, that of president of the Merchant Marine League of the United States, which has been organized to further the development of over-sea commerce in American ships. Mr. Goulder's selection as president of the National Rivers and Harbors Congress is also especially felicitous in that he has been for years past associated with Hon. T. E. Burton, chairman of the committee of rivers and harbors of the house of representatives in the study of our waterways. Whatever, therefore, these two gentlemen may in the future unite upon to facilitate waterborne commerce, may be absolutely depended upon as being sound and worthy of adoption.

It so happens that by the caprice of nature the iron ore deposits of the United States, which are so necessary to its continued existence as a pig iron making country, are all located in the Lake Superior region. There are, of course, enormous deposits elsewhere, as in Alabama, but the Lake Superior deposits will retain their supremacy so long as they last owing to the cheapness of their transportation to the furnaces, which is one of the chief measures of value as cost of transportation figures very largely in the cost to the manufactured product. Subtract the iron ore shipments from the total movement of freight through the Sault Ste. Marie canals and the remainder is not a considerable item. Last year the commodities moved through the canal consisted three-fourths of iron ore. So long as this stream comes uninterruptedly down the lakes, so long will the United States continue to be the premier iron-making country. Iron is the foundation of all our industries, and so long as it is active, all correlated industries are active also. It is, therefore, quite easy to see how every man, woman and child in the United States is intimately concerned with the iron mining industry of the Lake Superior country. Any attempt whatever to interrupt this commerce should be a matter of personal concern with them, for, if seriously disturbed in any way, it will assuredly effect their pocketbooks.

The locks at Sault Ste. Marie have already grown inadequate to accommodate the iron ore carriers of the great lakes. The Poe lock, which was designed to accommodate four modern lake carriers at once, was not even finished before it was discovered that it could accommodate only two. Today it can accommodate only one—and this lock is the greatest artificial basin in the world. So fast is lake trade growing that the mere increase in the commerce of 1905 over that of 1904 is greater than was the total commerce of the great lakes ten years ago. It is impossible to tell to what dimensions it will expand. The wildest dreams of today in lake trade are the common realities of tomorrow.

There is now projected to be constructed north of the Poe lock a third lock to be 1,300 ft. long and 75 ft. wide. If work is begun upon this new structure at once, it will not be completed within three years. It is no wild prediction to say that five years hence a fourth lock may be necessary. The chief duty of the United States is to see that the necessary lands are preserved for the building of these locks and for the construction of a forebay from which they may be conveniently filled. This statement is made advisedly, because, in a commercial sense, the construction of the Panama canal is insignificant in comparison with it. Not for many, many years after the Panama canal is completed will it begin to pass one-fifth the annual

commerce that now traverses the Sault Ste. Marie canals. A number of private companies are seeking rights to divert water from the rapids of St. Mary's river. Whatever their private claims may be, or whatever their vested rights are they are as nothing compared to the inherent right of navigation, to the right that the people of the United States have to enjoy uninterruptedly, the period of prosperity that depends upon the constant interchange of commerce between the upper and lower lakes. The Lake Carriers' Association can render no more important service to the country than in safeguarding the interests of vessel owners at Sault Ste. Marie.

AT THE HEAD OF THE LAKES.

Duluth, Minn., Jan. 15.—It has been decided to abandon the old wood steamer Geo. Spencer, ashore on the north shore of Lake Superior, and she will be left to her fate. Other vessels lying on the beaches as the result of fall gales are by the salvers abandoned till spring.

The Duluth-Superior Dredging Co. has launched its first big dump scow, said to be the largest on the lakes, and will follow it by two others between now and spring. The company's immense dredge "Industry" was launched some days ago. This dredge hull is exceptionally strong, built of fir, oak and steel. It is 125 ft. long and 43 ft. beam, and will carry Bucyrus machinery and a ten-yard dipper.

There is an enormous amount of coal dock work under way at the head of the lakes this winter. The biggest job is that of the Pittsburg company at Port Arthur, where a part of what will ultimately be the largest dock in the world is well along toward completion. At Washburn the old Ohio and Northwestern Fuel docks will be enlarged by an extension of 200 ft., with an additional clamshell machine for the Northwestern dock, which will thus be given a considerably increased unloading capacity. The Northwestern Coal Co.'s big dock on the bay front at Superior, which was partly built two years ago, will be completed this year, and the present unloading and storage space will thereby be doubled. This work is expected to cost in the neighborhood of $600,000. The Philadelphia & Reading Coal Co., which now uses some Great Northern dock space for its coal business has acquired a site for a large receiving dock, on Conners point and will build there the coming year.

The plan of building a dry dock and repair shops at Ripley, Lake Superior, is working along, and in a short time should materialize, if the plans of those interested can be carried forward as successfully as expected. Portage lake is a good place for a dock, if there is sufficient business to get there instead of coming to the head of the lake.

The harbor business of the Duluth-Superior harbor, this being the official government designation of the two harbors at the head of Lake Superior, has been 22,676,145 tons during 1905. The figures are not from custom house statements, which are necessarily and notoriously inaccurate but from the reports of masters to the U. S. engineers' office, and are supposed to be correct. The value of this commerce amounted to $196,751,583, of which amount Superior gets $90,936,285. Of the tonnage Duluth is credited with 13,139,541 and Superior with 9,536,904. The average daily receipts and shipments of waterborne commerce during the season of navigation was about 90,000 tons. There were 254 days of lower lake navigation during the year, while there were about 325 days of Lake Superior navigation. This latter was interrupted by ice in February, 1905 and continued till Dec. 31st. During the past ten years the receipts and shipments of freight from the head of the lake has amounted to 143,900,000 tons.

Grain stocks now amount to about 15,000,000 and have increased 1,200,000 bu. this week. In the past week about 1,250,000 bu. of flax has been sold here for export next spring.

CHICAGO GRAIN REPORT.

Chicago, Jan. 16.—There has been no special activity in winter bookings up to this time and, outside of some hold-over cargoes from last season, on which rate is said to have been settled at 3 cents wheat,—the engagements are limited to a few cargoes of Buffalo spring delivery oats at 1¾ cents per bushel. It is expected that some further business will be developed in the latter end of this month inasmuch that there is a steady country movement, and elevator stocks at this time are already some 12,000,000 bu. in excess of the year ago. Doubtless there will shortly be an extensive export movement from western points via the gulf, but nevertheless cash conditions give promise of a considerable routing toward Chicago elevators, and growing out of which vessels likely to meet with good inquiry from the storage standpoint.

Compared with previous years the available winter supply of vessels, exclusive of liners, notes a better distribution and some considerable reduction—as shown in the following estimate:—

	1906	1905	1904
At Chicago and South Chicago	7,760,000	4,750,000	6,000,000
At Milwaukee	7,270,000	16,000,000	11,000,000
At Lake Mich., By Ports—est.	1,500,000	2,000,000	1,250,000
Total	16,530,000	22,750,000	18,250,000

RECEIPTS OF GRAIN.

	This week	Last week	Same week last year
Wheat	241,485	226,000	350,000
Corn	1,840,200	2,424,650	2,458,600
Oats	1,566,350	1,959,850	1,012,400
Rye	36,050	51,000	50,400
Barley	376,752	372,077	533,992
Total	4,060,837	5,033,577	4,405,392

RECEIPTS OF GRAIN.

	Since Jan. 1st, '06	Same time last year
Wheat	467,485	606,347
Corn	4,264,850	3,527,370
Oats	3,526,200	2,417,812
Rye	87,050	63,433
Barley	748,829	327,106
Total	9,094,414	6,942,068

STOCKS OF GRAIN IN ELEVATORS.

	This week	Last week	Same week last year
Wheat	8,888,000	9,265,000	3,946,000
Corn	6,523,000	6,447,000	6,314,000
Oats	11,497,000	11,637,000	5,461,000
Rye	793,000	759,000	451,000
Barley	442,000	346,000	159,000
Total	28,143,000	28,454,000	16,331,000

The Toledo Ship Building Co. launched the steamer Eugene Zimmerman on Thursday of this week. The steamer is building for L. S. Sullivan and others of Toledo and is named after the well-known Cincinnati railroad magnate.

Lake Carriers' Association.

One of these days Al Rumsey will expire in a fit of apoplexy through his efforts to assemble the members of the Lake Carriers' Association at their annual conventions in Detroit. Year after year he stands on the marble stair case of the Cadillac hotel howling at the top of his voice, and growing purpler each year. No one pays the slightest attention to him and in the course of an hour or two he pauses for breath. Then realizing the futility of his oratorical efforts he descends to the floor and bodily picks up one of the members and shoves him up the staircase. In this manner has the Lake Carriers' Association been called together year after year and the meeting which opened at the Cadillac on Thursday last was no exception.

The meeting was called to order, as usual, by President Livingstone who submitted his annual report and commented at length upon it. There is a great deal of valuable information in this report to which attention will be paid by the MARINE REVIEW later. Since the Lake Carriers' Association became an incorporated body its method of transacting business has been much simplified. What hitherto took weeks to accomplish is now done in the same number of days. The real work of the association devolves upon the executive committee and there is little for the association as a body to do. So well is the importance of this committee recognized that the association appointed an alternate for each member of it. Hitherto it has sometimes been found impossible to get a quorum of the committee together owing to absences from the city. Hereafter when a member is unavoidably absent his alternate may attend and exercise the prerogatives of the member.

The old board of directors was re-elected with the exception that Mr. W. H. Becker of Cleveland was added to it. The board now consists of J. C. Gilchrist, H. Coulby, Captain James Corrigan, H. A. Hawgood, Captain John Mitchell, J. H. Sheadle, Harvey D. Goulder, J. E. Upson and W. H. Becker all of Cleveland; William Livingstone, Detroit; C. W. Elphicke, D. Sullivan of Chicago; F. W. Smith of Milwaukee; Frank J. Firth of Philadelphia; Edward Smith, T. T. Morford, E. T. Evans, and G. L. Douglass of Buffalo; C. A. Eddy of Bay City; A. B. Wolvin and G. A. Tomlinson of Duluth and H. S. Wilkinson of Syracuse.

All the old officers were re-elected as follows: President, William Livingstone; vice president, J. H. Sheadle; secretary, George A. Marr; treasurer, Captain George P. McKay; counsel, Harvey D. Goulder. Only one change was made in the personnel of the executive committee. As Mr. E. T. Evans of Buffalo desired to retire, Mr. T. T. Morford was elected a member in his place. The new committee with alternates now stands as follows:

Member.	Alternate.
T. T. Morford	J. C. Evans
Edward Smith	E. T. Douglass
Harry Coulby	Dennis Sullivan
Henry A. Hawgood	G. A. Tomlinson
Capt. James Corrigan	Capt. John Mitchell
A. B. Wolvin	J. H. Sheadle
J. C. Gilchrist	J. A. Gilchrist

This plan will make it possible to have a full membership of the committee present when conferences are held in Cleveland with labor next March.

The association is in excellent financial condition, the report of the treasurer showing a balance of $49,397.98. The tonnage now enrolled in the association numbers 542 vessels of 1,411,794 tons as against 608 vessels with a total tonnage of 1,399,027 tons at the close of 1904. The season of 1905 has been unprecedented in the history of lake marine in the nature of vessel losses. The loss of tonnage to the association has been very large, amounting by reason of wrecks, sale and other causes, to 162,497 tons.

The morning session was very brief and no business of a public nature was transacted during the afternoon. The practice inaugurated by Mr. Harry Coulby last year of bringing the members together at a banquet was followed this year by the association itself and a dinner of unusual elaborateness was served in the evening. Mr. Coulby himself could not be present as he had to leave for New York the day before. There were no set speeches, the entertainment in the early part of the evening being provided by vaudeville performers from the Detroit theatres. Their hits were made largely by reference to the members present and especially by paraphrasing the song "Everybody Works but Father" into "Everybody Works but Sailor Bill."

As stated, there was no program of speeches but President Livingstone called generously upon the members for brief remarks. Probably the most entertaining of these impromptu speakers was Mr. C. F. Kremer of Chicago who kept the members convulsed with his humorous sayings. Al Rumsey appeared at the gathering for the first time in a full dress suit which fitted him so snugly that it could not have fitted him better had he been melted and poured into it. This led Mr. Kremer to remark that Rumsey had the head waiter and the president skinned on clothes and Dennis Sullivan, who is very much of a wag, promptly advised Rumsey to buy it.

Others who spoke briefly were Harvey D. Goulder, Antonio C. Pessano, Jasper H. Sheadle and Captain John Mitchell. The banquet was opened by drinking a toast to the president of the United States and closed by proposing one to Robert Wallace, the nestor of great lakes ship builders.

The opening session of the second day was an executive one. The question of dealing with the mates of the vessels through a labor organization was to be taken up and the members felt that they could speak more freely if they spoke in private. There were about twelve speakers and the sentiment was unanimous that the mates should be dealt with as individuals and not as members of a labor organization. The members felt that there was no alternative presented as the mate is in direct line of succession for master who is, of course, the owner's representative aboard ship. In point of fact, the mate is about half the time in charge of the ship. Both the Longshoremen's association and the Lake Seamen's union are organizing the mates and were desirous of arranging a conference with the Lake Carriers for the mates, but the following resolution was unanimously adopted:

> Resolved that the mates are executive officers and the source to which we look for masters and are educating to be masters of our ships. Our captains are instructed not to employ any mate who is a member or affiliated with any labor union.

It is understood that a number of owners have already lined up their mates for the coming season and no difficulty whatever is anticipated from this source during the year.

One of the important things discussed at the convention was the granting of charters by the federal government to private interests for the diversion of water from the rapids in St. Mary's river. In the discussion of this sub-

ject Mr. Harvey D. Goulder, counsel of the association, was especially luminous. He had prepared an address upon the subject but in his remarks did not refer to it at all. He stated that the persons who are endeavoring to get power from the rapids are trying to make it appear that the Lake Carriers' association is endorsing one private interest or another. He thought that the association could not afford to become involved in any private controversy. He believed it to be absolutely essential for the safeguarding of navigation that no more rights should be granted to private interests in St. Mary's river. He was quite convinced that all of the space north of the present locks and extending to the international boundary line would be required for the new locks, within a short time. In fact, he predicted that the present generation of vessel owners would find the number of American locks at the Sault canal increased from two to five. It would not be possible to feed all these locks from a canal. Mr. Goulder maintained that a forebay would have to be provided for that purpose which would necessitate every inch of space now available from the present locks to the international boundary line. Mr. Goulder insisted that all work that has been started by private interests should be stopped and all licenses that had been granted should be revoked. Accordingly the following resolution offered by Captain Dennis Sullivan of Chicago was unanimously adopted:

> We declare our opposition to the works in progress and proposed, or any encroachment, and call upon the government to clear out the rapids from all encroachment and private improvements, and if the parties operating these have vested rights that the government acquire the same in proper and just manner. This action is taken upon the conviction that the needs of the country demand that the whole space north of the present locks and government works out to the international boundary line is required and will be rapidly utilized for navigation purposes.

Captain Dennis Sullivan presented resolutions from the Chicago Board of Trade and shippers in the northwest urging the association to do everything to prevent further encroachment by private interests at the Sault. The association will from now on keep a watchful eye upon the situation at Sault Ste. Marie and will not suffer the subject to be dropped. The commerce of the St. Mary's canals is so great and is so rapidly growing and is so necessary to an uninterrupted state of industry throughout the entire country that the construction of the Panama canal is really an unimportant item in comparison with it.

Col. Charles E. L. B. Davis, government engineer with headquarters at Detroit, addressed the convention upon the improvements in St. Mary's river. He said that it had been practically decided to construct the third lock north of the Poe lock, but allowing a greater difference between it and the Poe lock than now exists between the Poe and theWeitzel locks. The new lock will be 1,300 feet long and 75 feet wide and will probably take about three years to complete. There had been some talk of constructing the new lock on the side of the Weitzel lock, but the Weitzel lock is really used quite as much as the Poe lock, upbound vessels using it almost exclusively.

President Livingstone took occasion to pay a tribute to Congressman Burton whom he held to be a true, honest and hard-working friend of the Lake Carriers' association and one who has displayed great knowledge, intelligence and energy in dealing with lake improvements.

Mr. A. R. Rumsey was appointed shipping commissioner by the executive committee.

The attendance this year was rather small, those present being: Edward Smith, Buffalo; W. M. Mills, Tonawanda; M. M. Drake, Buffalo; T. T. Morford, Buffalo; E. T. Douglass, Buffalo; R. J. Dunham, Chicago; Dennis Sullivan, Chicago; W. H. Becker, Cleveland; J. J. H. Brown, Buffalo; Harvey D. Goulder, Cleveland; J. H. Sheadle, Cleveland; J. C. Gilchrist, Cleveland; G. A. Tomlinson, Duluth; Robert Logan, Cleveland; C. W. Elphicke, Chicago; A. H. Hawgood, Cleveland; C. L. Hutchinson, Cleveland; C. O. Jenkins, Cleveland; John Mitchell, Cleveland; C. F. Kremer, Chicago; J. E. Upson, Cleveland; Oliver Upson, Cleveland; W. C. Richardson, Cleveland; Frank Seither, Cleveland; Captain Ed Morton, Cleveland; M. B. McMillan, Detroit; R. T. Gray, Detroit; P. H. McMillan, Detroit; James C. Wallace, Cleveland; Robert Wallace, Cleveland; F. W. Smith, Milwaukee; C. C. Joys, Milwaukee; W. H. McGean, Cleveland; J. S. Ashley, Cleveland; N. J. Boylan, Cleveland; John Donaldson, Cleveland.

WEAKNESS OF OUR NAVY.

Rear Admiral Joseph B. Coghlan delivered a sensational speech in New York this week in which he declared that the navy of the United States was far below the strength that the public believed it was and that instead of having forty fighting ships, as we have on paper, there were really only eighteen ships of the fighting class, and of these two were now out of order, so that our real navy consists of sixteen ships. The speech caused a stir among the 200 members present and Coghlan's fearlessness in speaking publicly of the weakness of the navy was broadly commented on.

"We are in need of a merchant marine, but we are more in need of battleships," said Rear Admiral Coghlan. "Many of our ships are old timers, and yet they are carried on our list of fighting ships. It would cost a fortune to make the Olympia, Dewey's flagship in Manila Bay, a fighting vessel. The war in the east has taught us one lesson and that is that the battleship is the only vessel to carry on a war or to decide a war at a critical issue. We must build more battleships if we are to hold our own.

"We have twenty-seven battleships now in course of construction, and by 1908 we will employ 65,000 men in our navy where we now employ only 36,000, and thus far we are going along strong lines. But our navy will never be like England's for we are not building enough, nor building fast enough to catch up to her.

MONITORS ARE USELESS.

"Following the fads of various persons, we find among our twenty-seven fighting ships some millions of dollars wasted on four monitors. In the harbor of Manila I have seen one of them rolling twenty times a minute trying to hit something with a 12-inch gun—much as I have seen a woman trying to hit a hen with a stone."

He declared that the monitor and sub-marine types of boats were practically useless as fighting vessels, but lauded the torpedo boat as one of the most powerful engines of a navy.

A successful speed test of one of the new self-bailing self-motor life boats built by the Electric Launch Co. of New York, was made recently. Capt. Charles Hugh McLellan, inspector and superintendent of construction of the United States Life Saving Station was on board. The trip was made for the purpose of testing the efficiency of the motor which is of the Standard type and of 25 H. P. Under sailing power the boat averaged about nine knots an hour. Capt. McLellan stated that the trial was entirely satisfactory and that it is the intention of the government to have a number of the motor boats at various points in the inlets adjacent to the life saving stations along the Atlantic coast and also on the great lakes. The boats are 34 ft. long and weigh about five and a half tons. Such a boat pulls ten oars and carries sprit sails which can be reefed.

AVERAGE LAKE FREIGHT.

There is herewith presented the usual annual summary of lake freight for the season of 1905. Further evidence is given in the tables of the tendency of the daily or wild rate to work out at the end of the season at approximately the contract rate. Lake freights are, indeed, becoming as stable as rail rates. Contract rates on ore were fixed early in March on a basis of 75 cents from the head of the lakes, 70 cents from Marquette and 60 cents from Escanaba. Independent interests had taken at that time orders to deliver 13,000,000 tons of ore and a total movement of 30,000,000 tons was then predicted. The lake movement for 1905 actually reached nearly 34,000,000 tons. Vessels started out on April 8 but were stalled in the ice above the Sault for ten days and navigation was not well under way until May 1. It is interesting to observe that season contracts for 1906 for the movement of ore have already been made on the basis of 1905 and that an even greater quantity of ore has been sold for 1906 delivery than was ever sold thus early in advance before.

Coal rates opened at 35 cents to the head of the lakes and 45 cents to Milwaukee on April 20, falling 5 cents in each case on June 1 and maintaining that rate until fall, when they steadily advanced until $1 was paid on a few belated cargoes. The different summaries of average rates are as follows:

AVERAGE DAILY RATES OF FREIGHT ON THE GREAT LAKES.

	1904 Cents.	1903 Cents.	1905 Cents.
Iron ore, Escanaba to Ohio ports	53.6	60.9	60.75
Iron ore, head of Lake Superior to Ohio ports, gross ton	70.3	80.9	76.875
Iron ore, Marquette to Ohio ports, gross ton	62.4	72.1	70
Wheat Chicago to Buffalo, bushel	1.3	1.4	1.6719
Wheat, Duluth to Buffalo, bushel	1.8	1.6	2.315
Soft coal, Ohio ports to Milwaukee, net ton	47.4	50.7	46.525
Soft coal, Ohio ports to Duluth, net ton	37.1	41.5	33.5
Soft coal, Ohio ports to Portage, net ton	35.6	40.0	35.3
Soft coal, Ohio ports to Manitowoc, net ton	40.6	45.9	41.525
Soft coal, Ohio ports to Sheboygan, net ton	40.6	45.9	41.525
Soft coal, Ohio ports to Green Bay, net ton	45.6	50.7	42.425
Soft coal, Ohio ports to Escanaba, net ton	40.6	45.0	41.525
Hard coal, Buffalo to Milwaukee, net ton	43.4	48.1	44.575
Hard coal, Buffalo to Chicago, net ton	43.4	48.1	44.575
Hard coal, Buffalo to Duluth, net ton	33.9	38.1	33.05
Lumber, head of the lakes to Ohio ports	254.0	257.6	245.375

AVERAGE DAILY FREIGHT RATES, TEN YEARS ENDING WITH 1904.

	Cents
Iron ore, head of Lake Superior to Ohio ports, gross ton	80
Iron ore, Marquette to Ohio ports, gross ton	72
Iron ore, Escanaba to Ohio ports, gross ton	61
Soft coal, Ohio ports to Milwaukee, net ton	44
Soft coal, Ohio ports to Duluth, net ton	35
Hard coal, Buffalo to Chicago, net ton	44
Hard coal, Buffalo to Duluth, net ton	34
Wheat, Chicago to Buffalo, bushel	1.66

AVERAGE OF DAILY LAKE FREIGHT RATES ON HARD COAL FROM BUFFALO TO CHICAGO, MILWAUKEE AND DULUTH DURING TEN YEARS PAST.

Year	Chicago Cents	Duluth Cents
1896	36	24
1897	29	26
1898	28	23
1899	73	49½
1900	48	39½
1901	50	38
1902	42	33
1903	48	38
1904	43	34
1905	44	34
Average for ten years	44	34

Rate to Milwaukee practically same as to Chicago.

Hard coal is net tons and is handled without charge to vessels.

AVERAGE OF DAILY RATES ON SOFT COAL FROM OHIO PORTS TO CHICAGO, MILWAUKEE, ESCANABA, DULUTH, GREEN BAY AND MANITOWOC.

Year	Milwaukee Cents	Escanaba Cents	Duluth Cents	Green Bay Cents	Manitowoc Cents
1897	28½	29½	26	30	31
1898	28	26½	23	28½	28½
1899	69	58	45½	66½	67
1900	45	40	40	45	43½
1901	49	46	38	48½	48
1902	46½	41½	34½	46½	42
1903	50½	45	41½	50½	46
1904	47	40	37	45½	47
1905	46½	41½	33½	42	41½
Av. for 10 years	44	39½	35	43½	43

Chicago rate about the same as Milwaukee.

Coal of all kinds shipped in net tons and handled without charge to vessel.

AVERAGE FREIGHT RATES ON IRON ORE PER GROSS TON, FROM PORTS NAMED TO OHIO PORTS—TABLE COVERING WILD AND CONTRACT RATES FOR TWENTY YEARS PAST.

	Escanaba		Marquette		Ashland and other ports at the head of Lake Superior	
Year	Wild or daily rate	Contract rate	Wild or daily rate	Contract rate	Wild or daily rate	Contract rate
1886	1.28	1.05	1.51	1.20	1.78	1.20
1887	1.59	1.40	1.87	1.63	2.23	2.00
1888	1.05	.90	1.30	1.15	1.43	1.25
1889	1.01	1.00	1.19	1.10	1.34	1.25
1890	.89	1.10	1.07	1.25	1.17	1.35
1891	.84	.65	1.02	.90	1.11	1.00
1892	.74	1.00	.98	1.15	1.15	1.25
1893	.56	.85	.71	1.00	.77	1.00
1894	.47	.60	.60	.80	.78	.80
1895	.73	.55	.92	.75	1.13	.80
1896	.52	.70	.66	.95	.77	1.05
1897	.45	.45	.55	.65	.57	.70
1898	.51	.45	.60	.60	.62	.60
1899	.95	.50	1.08½	.60	1.29½	.60
1900	.69½	1.00	.78	1.10	.84½	1.25
1901	.64	.60	.79	.70	.89	.80
1902	.59	.60	.66	.70	.77	.75
1903	.61	.65	.72	.75	.81	.85
1904	.53½	.55	.62	.60	.70	.70
1905	.61	.60	.70	.70	.77	.75

Charge to vessels in 1905 for unloading iron ore was 20 cents per ton. The wooden vessels that required trimming paid an additional charge of about 3 cents per ton for that service.

Average ore rates for the entire period of twenty years: Escanaba, contract 76 cents, wild 76 cents; Marquette, contract 91 cents, wild 91 cents; Ashland and other ports at the head of Lake Superior, contract $1.00, wild $1.05. Average for past ten years: Escanaba, contract 61 cents, wild 61 cents; Marquette, contract 73½ cents, wild 72 cents; Ashland and other ports at the head of Lake Superior, contract 80½ cents, wild 80 cents.

RANGE OF LAKE FREIGHT RATES ON WHEAT FROM DULUTH TO BUFFALO.

Year	Rate, cents	Year	Rate, cents
1905	2.31	1894	1¼@3
1904	1.81	1893	1¼@3½
1903	1.6	1892	2¼@4
1902	1.9	1891	1¾@9½
1901	2.3	1890	2 @5
1900	2.0	1889	2 @5
1899	3.6	1888	2 @5
1898	1.8	1887	2 @8
1897	1.75	1886	3¼@8
1896	2.12		
1895	3.50		

Figures for ten years past represent average of daily rates for full season, previous to 1895 the rates are highest and lowest in the different seasons.

AVERAGE ON WHEAT PER BUSHEL FROM CHICAGO TO BUFFALO.

Year	Rate Cents	Year	Rate Cents	Year	Rate Cents
1860	9.89	1874	4.03	1888	2.56
1861	11.53	1875	3.42	1889	2.51
1862	10.49	1876	2.90	1890	1.96
1863	7.51	1877	3.72	1891	2.38
1864	9.58	1878	3.07	1892	2.19
1865	9.78	1879	4.74	1893	1.66
1866	12.34	1880	5.76	1894	1.27
1867	6.67	1881	3.44	1895	1.97
1868	7.14	1882	2.50	1896	1.70
1869	6.81	1883	3.41	1897	1.56
1870	5.88	1884	2.18	1898	1.53
1871	7.62	1885	2.02	1899	2.71
1872	11.46	1886	3.68	1900	1.79
1873	7.62	1887	4.13	1901	1.42
				1902	1.51
Average, forty-six years, 4.49 cents				1903	1.41
				1904	1.32
				1905	1.67

Charges to vessels for shoveling, trimming and tallying weights of grain amounted to $4.12½ per 1,000 bushels in 1905.

THE SITUATION AT BUFFALO.

Buffalo, Jan. 16.—A local vessel man who went to the annual meeting of the Lake Carriers' Association at Detroit last week found that the chief cause for concern over the future of the lake trade was the size of the fleet and the funny part of it all was that the vessel owners who were loudest in their expression of concern about overbuilding were the very ones who had contracts for new steamers of their own!

Well, they ought to know if anyone does, though it may not be in the best possible taste to be so terribly afraid that there is prospect of too many ducks with you in the puddle. It seemed to our vessel man that if he had a 10,000 tonner or two going up, ready to swell the tonnage of next season he would have discoursed more generally on the mildness of the winter or something of that sort. We are a pretty selfish lot, the chief excuse for it being that business at the best is mostly the outcome of a selfish desire to have things or to run people and things, all of it being an outgrowth of the instinct of self-preservation.

It is all right if kept in the proper channel, but it may be overdone, especially when we get too eager in the game of crowding each other off the earth. As to the fear of too many vessels it has been thick in the dreams of lake men for 40 years. The late D. S. Bennett of Buffalo, who was builder and owner of the first modern grain elevator here, used to be much exercised over the growth of lake tonnage—as everybody was and is—and he once told me that when the first schooner came down from the upper lakes with a cargo of 10,000 bushels of grain somebody wrote a long article in a Buffalo paper to prove that craft of such size could never be made to pay!

I am afraid that if Mr. Bennett had been assured at that time, a matter of fifteen years or more ago, of the size of the lake steamer of today he would have joined in the protest. One thing is certain—we must have some new harbors all around if the present size of the craft is to be improved upon to any extent. Buffalo at least is becoming more or less alarmed over the problem and an effort is to be made to wake up the city fathers on the subject. It is said that if the alarm of certain vessel men here had not borne some fruit in the way of dredging last season the late achievement of handling and laying up 150 lake vessels, most of them very large, would have been impossible.

When President Pierce took leave of the management of the affairs of the Chamber of Commerce in his annual address at the election of that body last week he gave as one of the three things most needed by the city a general improvement of the harbor and he is not rated as a lake man, either. When he gave as another of the three the bettering of transportation facilities between the city and the Steel Plant he might easily have spoken as president of the street railway system of the Niagara frontier, but he can have had no special interest in the harbor. Transportation by land seldom finds any virtue in transportation by water.

So it may happen that the city will be found a trifle awake to harbor improvements this year, especially as the building of the ship canal in Niagara river will now begin to take shape. That will be a good deal of a revolution in itself and ought to be finished before the poor old harbor gets too much run down. It is too bad, though, that the looking to government for things fosters idleness on our part. Buffalo has been a great beneficiary in that line. There is more than four miles of government breakwater in front of the harbor and we justified the outlay from a selfish standpoint by getting the big steel plant on the score of it, but we have for all that done less for ourselves than we would have done if there had been no outside help.

Such a winter as it has been so far! The poor ice man is beginning to be scared and the shippers of coal and other non-perishable freight are sorry they have so little to offer for immediate loading. It may happen that loading will be resumed before long unless the ice comes. Think of it—a fleet such as is lying here and so many of the vessels loaded that the supply of tonnage has given out, as all that are not loaded are in need of repairs. This has never happened before. By this time last winter the problem was how to get about in the harbor at all and before the ice was finally out of the way one of the flour mills had to shut down because a cargo it needed was fast in the ice and out of reach of rail transportation. Never has the easy movement in harbor been so needed as now, but it is possible to overdo almost anything.

JOHN CHAMBERLIN.

RECEIPTS OF GRAIN AT BUFFALO.

The report of Junius S. Smith, lake weighmaster at Buffalo, shows that the total receipts or grain at that port during 1905 were as follows:

	Bushels.	Tons
Wheat	40,453,000	1,213,590
Corn	32,753,000	867,084
Oats	25,734,000	411,744
Rye	689,000	19,282
Barley	14,625,000	351,000
Flax seed	12,261,000	343,308
Total	126,515,000	3,206,008

AROUND THE GREAT LAKES.

It is reported that the repairs of the steamer William E. Corey will amount to $100,000.

The West Superior yard of the American Ship Building Co. is unusually busy and over 1,100 workmen are now employed there.

Work on the new canal at St. Clair Flats has been suspended for the winter, but the contractors, M. Rabbitt & Sons, expect to resume operations about April 1.

A revised chart in colors of Lake Superior including Isle Royale has just been issued by the United States lake survey office and is now on sale by the MARINE REVIEW.

A revised chart of Grand Island and approaches, Lake Superior, has just been issued by the United States lake survey office and is for sale by the MARINE REVIEW.

Wm. S. Cleaves, proprietor of the Portage Lake Foundry & Machine Works, Hancock, Mich., has started a movement to build a dry dock at Hancock to cost $500,000.

The Indiana Steamship Co. will name the new steamer now building for it at the yard of the Toledo Ship Building Co., Toledo, Theodore Roosevelt. The president has given his consent to the use of his name.

The Goodrich Transportation of Chicago will hereafter care for its fleet at Muskegon instead of at Manitowoc. Railway encroachments at Manitowoc have made it necessary for the company to transfer its machine shops to Muskegon.

The Empire Ship Building Co., of Buffalo, has contracts for a steel dump scow 150 ft. long to be used by the Lake Erie Dredging Co., Buffalo, in its work at the Sault; also a steel lighter 125 ft. long for the Western Transit Co. to be used at Duluth and a steel sand sucker 120 ft. long for Erie parties.

George H. Spurbeck, of Two Harbors, has been awarded the contract for erecting a timber portion of the new coal dock of the Duluth & Iron Range Railway to be built at Two Harbors this winter. The new dock will have a water frontage of 500 ft. and a storage capacity for 100,000 tons of coal.

Capt. T. V. O'Connor was re-elected president of the Licensed Tugmen's Protective Association at Buffalo and chosen delegate to the January convention in Chicago. The other officers elected were. Vice president, Joseph Green; secretary-treasurer, A. G. Gilbert; corresponding secretary, William Fox; trustee, Morgan Hart.

The Marine Engineers' Beneficial Association at Buffalo elected the following officers: John Davidson, president; Frank Mansfield, and John Rainy, vice presidents; secretary-treasurer, W. D. Blaicher; trustee, J. G. Hager; delegates to national convention, W. D. Blaicher, Edwin Marshall, William Gilbert; alternates, W. B. Roche and John Davidson.

The Tug Firemen and Linemen's Protective Association have elected the following officers for 1906: Charles P. McCarthy, president; James P. Synan, vice president; John Cooney, corresponding secretary; Ed Doyle, secretary and treasurer; Thomas Hewitt, marshall; Frank McDaniel, conductor; Terry McIntyre, sergeant-at-arms. Trustees, Thomas McNaugh, A. McCarthy, Con O'Donnell.

The International Brotherhood of Steamshovel and Dredgemen have elected the following officers:

General president, Charles Rees, Chicago; first vice president, Charles E. Newall, Buffalo; general secretary-treasurer, T. J. Dolan Jr., Chicago. Directors, William Bates, Panama; Frederick Parrow, Boston; T. J. McGovern, Hibbing, Minn.; L. R. Scudder, Crane, Mo.; Michael McGinnis, Lockport, Ill.

The Lake Pilots' Protective Association at Buffalo elected the following officers: President, Charles Harris; vice president, B. McClarin; secretary, A. C. Beecraft; treasurer, E. L. Shaw; chaplain, H. J. Davis; conductor, R. O. Mallory; inside guard, Hugh McCann; outer guard, James Conners; trustees, John J. Cassin, James Burns and Joseph Saeger; delegates to Detroit convention, John J. Cassin, A. C. Beecraft, E. L. Shaw, Charles Harris, J. J. Connelly, alternates, William Allen and George McMinn.

For some little time there has been talk of building in Canada an ore carrier with transverse hopper similar to the Hoover & Mason constructed for G. A. Tomlinson of Duluth by the Great Lakes Engineering Works. It is now announced at the annual meeting of the Farrar Transportation Co. of Collingwood, Ont., that it has decided to build a 9,000-ton steamer to go into commission in the spring of 1907 and that the contract is to be given to the Collingwood Ship Building Co., Collingwood, Ont.

At the annual meeting of the International Brotherhood of Steamshovel and Dredgemen, the following officers were elected; general president, Charles Rees, of Chicago; first vice president, Charles E. Newell, Buffalo; general secretary and treasurer, T. J. Dolan, Chicago; directors, Wm. Bates, Panama; Frederick Parrow, Boston; T. J. McGovern, Hibbing, Minn.; L. R. Scudder, Crane, Mo.; Michael McGinnis, Lockport, Ill.

The secretary of war has appointed a commission of five United States engineers to pass upon the method of constructing the railway tunnel under the Detroit river at Detroit. This commission was appointed at the suggestion of Col. C. E. L. B. Davis, United States engineer at Detroit, who desired counsel on the subject. The commission will have its first meeting on Jan. 22. The commission consists of Col. Garrett J. Lydecker of Detroit; Lieut. Col. Dan C. Kingman of Cleveland; Major James G. Warren of Cincinnati; Capt. Wm. B. Judson of Milwaukee, and Capt. Charles Kellar of Detroit.

The first of the four 600-ft. steamers building for the United States Steel Corporation at the South Chicago yard of the American Ship Building Co. will be named after J. Pierpont Morgan. The two steamers building for the Cambria Steel Co. which will be 602 ft. over all are to be named Daniel J. Morrell and Edward Y. Townsend, who were the original organizers of the Cambria Steel Co. The big steamer building at the West Superior yard for the Hawgoods will be named after Abraham Stearn, of Cleveland.

The American Ship Building Co. will launch the steamer Charles S. Hebard building for the Wilson Transit Co. at its Cleveland yard on Saturday next.

OBITUARY.

Capt. John Prindiville, one of the oldest vesselmen on the great lakes, died in Chicago this week. He began his seafaring life on the schooner Constitution when he was twelve years old. At the age of eighteen he was captain of the Liberty and was the youngest master of a lake vessel in Chicago. He was the first commodore of the Chicago Yacht Club and became wealthy through judicious investments in real estate. He was at one time offered a purse of $1,200 for saving the crews of three vessels which were caught in a storm off Chicago on Nov. 26, 1856. The money had been collected by citizens and was offered to Prindiville by Senator Stephen A. Douglass, but Prindiville declined to take the money for doing what he considered only his duty. He suggested that the money be distributed among the widows of those whose lives had been lost.

Andrew G. Wilson, general manager of the marine department of the Maryland Steel Co., Sparrow's Point, Md., died very suddenly at his home in Wilmington, Del. recently. Mr. Wilson had been for thirty-six years associated with the Harlan & Hollingsworth Co., but went with the Maryland Steel Co. in 1898. He was a man of charming personality and occupied a prominent position as a naval architect and marine engineer.

Watertight Bulkheads for Battleships and Cruisers.

One of the important papers read at the recent meeting of the Society of Naval Architects & Marine Engineers in New York was Mr. Harold F. Norton's paper on "Notes on the Strength of Watertight Bulkheads for Battleships and Cruisers." This paper called forth considerable discussion which was led by Capt. William Hovgaard of the Royal Danish navy. Mr. Norton's paper was as follows:

The subject of watertight bulkheads is rather a broad one to attempt to discuss in general, but the navy department's specifications, and the tests prescribed for battleships and cruisers, immediately limit it very decidedly. In the latest ships these requirements are that all bulkheads below the protective deck shall be tested by filling the compartment on one side of the bulkhead with water under a head. This head is obtained by means of a stand pipe, and for all important bulkheads the top of the pipe is carried to a point 35 ft. above the bottom of the keel. Bulkheads so tested must stand the pressure "without appreciable permanent set, or deflection sufficient to cause serious leakage or endanger the collapse of the member tested." The amount of leakage tolerated being so slight, the deflection of the plating at any point must be held down sufficiently to prevent any danger of breaking the caulking. In fact, the deflection allowed at any point is so comparatively insignificant that the plating cannot be considered to act as a tie in any direction, but is practically relied upon only as a watertight diaphragm, the rigidity of the bulkhead against pressure depending almost entirely upon the stiffeners; the plating entering as a factor, only so far as it may be considered to form a part of the stiffener.

Usually the stiffeners are vertical, equally spaced, and bracketed at the heads and heels, as shown in Figs. 1 and 2. Since we cannot depend upon the plating to act as a tie, we must assume that the whole load of water pressure on a strip of plating extending on each side of the stiffener half way to the next stiffener, as shown in dash and dot lines, Figs. 1 and 2, is carried by the stiffener. In supporting this load, it is most reasonable to suppose that the stiffener conforms to the laws of flexure, and acts as a beam "fixed at the ends." This depends, of course, upon the assumption that the bracket connections at the ends are sufficient to "fix" the direction of the stiffener at these points.

It is proper, then, to take the length of the beam as being the distance between the points where the direction may be considered to be fixed. This may be usually assumed with safety to be about the first rivet in the bracket at each end, or the points A and B, Figs. 1 and 2. The load upon the beam, being due to the head of water on one side of the bulkhead, is greater at the bottom than at the top, and varies from one to the other in a straight line.

The formulae for the behavior of a beam of uniform section, so loaded, are not treated in the ordinary books on the flexure of beams, but were derived, by the author of this paper, for use in the discussion of the action of a certain bulkhead under test, as described in a paper published in Vol. 7 of the Transactions of the Society of Naval Architects and Marine Engineers, page 147. The full derivation of the formulae is given in the appendix of that paper, page 154. These formulae are, however, rather cumbersome for practical use, and it is the object of this paper to present certain curves, shown in Fig. 3, which have been derived from these formulae, and from which the required results may be immediately obtained.

It may be remarked in passing, however, that the general properties of the beam, as exhibited by these formulae, are shown in Fig. 4, from which it may be seen that the maximum moment occurs at the end of the beam, and the end where the load is greatest. It would, therefore, be at the bottom of the stiffener, or the point B, Fig. 1.

In any problem in the construction of bulkheads, stiffened as described above, the following quantities present themselves:

First. The height of the bulkhead, or rather the length of the stiffener between the points A and B, Figs. 1 and 2, assumed as the fixed ends of the stiffener. Let us call this L.

Second. The distance of the water level, either above or below the top of the bulkhead, or rather above or below the upper of the points to which *L* is measured, that is, the point A, Figs. 1 and 2. Let us call this distance *H*.

Third. The section modulus (equal the moment of inertia of stiffener divided by the distance of the outer fibre from the neutral axis), which we will call *S*.

Fourth. The maximum fibre stress, which we will call *R*, and—

Fifth. The spacing of the stiffeners, which we will call *W*.

The curves are arranged to give the value of a certain function, which we will call *B*, for any value of *H* and *L*, and is equal $\frac{R\,S}{W}$. So that having any four of these variable quantities, the other may be obtained from the curves.

The curves are laid out with values of *B*, for *R* in pounds per square inch and *W* in feet. We then proceed as follows:—

(*a*) Having given, say, the length of the stiffener, and the water level, the stress we are going to allow, and the spacing of stiffeners; to find the section modulus of stiffener required, we proceed to take from the curves the value of *B* for the given *H* and *L*, multiply this by *W*, and divide by *R*. The result is the section modulus required.

(*b*) Having given *H* and *L* and the allowable stress, and wishing to use a certain stiffener; to find the spacing necessary divide $R \times S$ by the value of *B*. The result is the required spacing of stiffeners in feet.

(*c*) Having given *H* and *L*, the spacing of the stiffeners and their section modulus, and wishing to find the maximum stress on the stiffeners; (that is, for a given bulkhead, wishing to find the stress on the stiffeners for a certain water level), multiply the value of *B* by the spacing of the stiffeners in feet, and divide by the section modulus. The result is the maximum stress on the stiffeners in pounds per square inch.

(*d*) Having given the section modulus, the spacing of stiffeners and the allowable stress, from these quantities we may at once obtain the value of *B*. That is, $R.S. \div W. = B.$ Then, picking out the curve corresponding to this value of *B*, we have at once; that for any length of stiffener which may be chosen, the corresponding water level is the maximum water level which that stiffener will stand without exceeding the given stress.

(*e*) Having given the same data as in (*d*) and following the same curve of *B*; for any water level, the corresponding length of stiffener is the maximum which will stand that water level without exceeding the given stress.

For instance, case (*a*), suppose the length of the stiffener (that is, from the bottom rivet in the top bracket to the

top rivet in the bottom bracket, or from A to B in Fig. 1) is 17′ 6″. Also that the water level is 10′ 0″ above the top of the stiffener, that is, above the point A, as shown in Fig. 1. By reference to the curves we find that a stiffener 17′ 6″ long, and a water level 10′ above the top of stiffener, the value of B is 400,000. Suppose these stiffeners are spaced 3′ 9″, or 3¾ feet apart, and that we are willing to allow 30,000 pounds per square inch maximum fibre stress (which, as will be seen from a later paragraph, is reasonable to allow for the test pressure on this class of bulkhead). Then proceeding as directed in case (*a*), we have

$$\frac{400{,}000 \times 3\frac{3}{4}}{30{,}000} = 50.$$

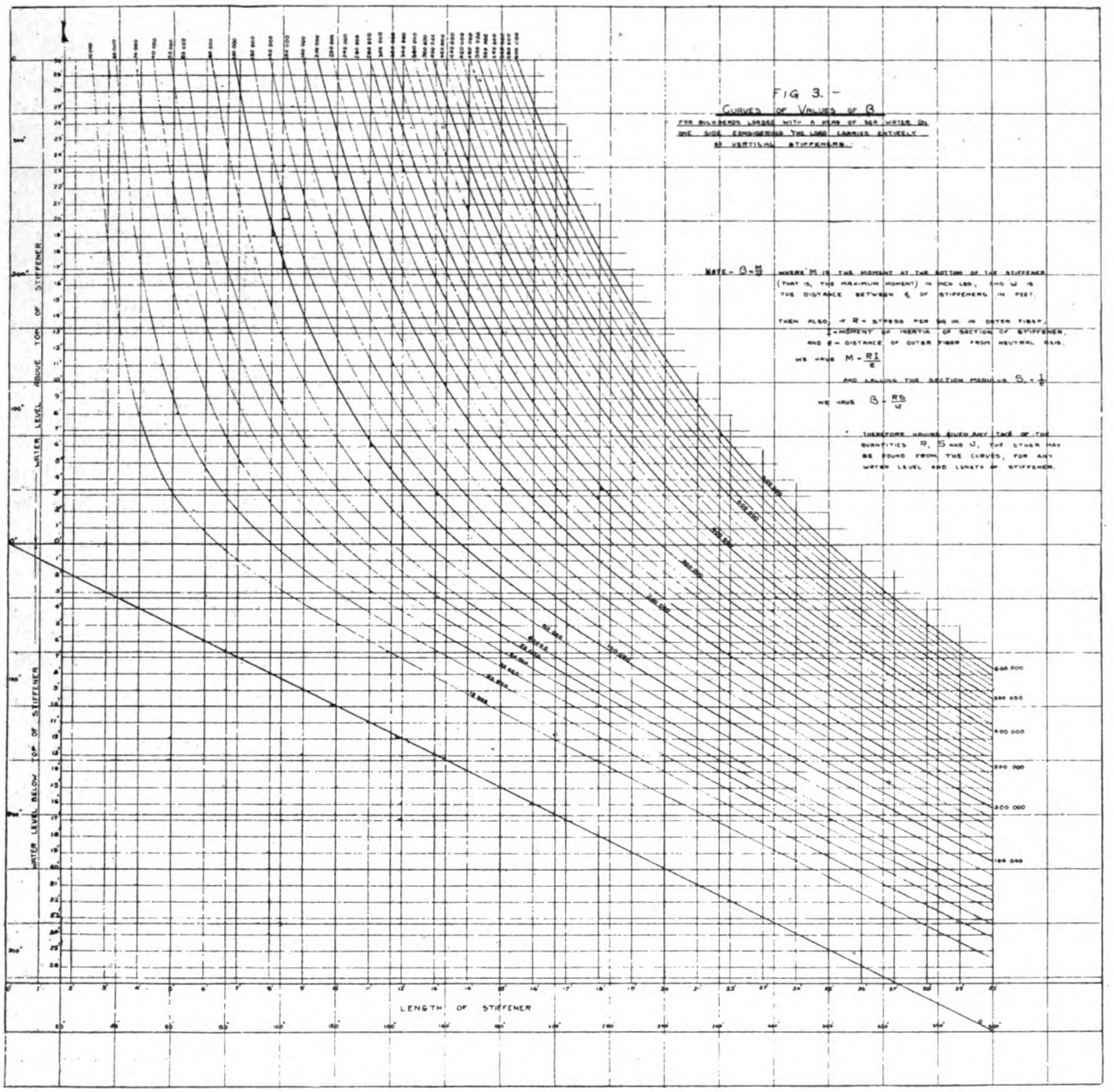
And in a later paragraph it will be shown that the section modulus for section of stiffeners represented in Fig. 1 is about 50.

Or, case (*b*), suppose we have the same bulkhead as above, with the section modulus given, and wish to find the maximum allowable spacing of stiffeners. Then as the length of the stiffeners and water level is the same, we find from the curves the same value of B, or 400,000. Dividing $R \times S$ by this, we have

$$\frac{30{,}000 \times 50}{400{,}000} = 3\frac{3}{4}.$$

the maximum allowable spacing of the stiffeners in feet.

Or, suppose, case (*b*), we wish to find the spacing of stiffeners for the bulkhead and water level shown in Fig. 2, allowing a maximum fibre stress of 25,000 pounds per square inch. For this arrangement of stiffeners the section modulus is about 24.



In Fig. 2, we find $H = 9'\ 8''$ and $L = 14'\ 4''$. For these values of ordinate and abscissa on the curves, we obtain = 240,000. Dividing $R \times S$ by this, we have

$$\frac{25{,}000 \times 24}{240{,}000} = 2.5.$$

That is with the stiffeners spaced 2′ 6″ the maximum fibre stress will be 25,000 pounds per square inch.

Now, suppose, case (*c*), we decide to space the above stiffeners 3′ between centers, and wished to know what the fibre stress would be then. Since *H* and *L* are the same as above, *B* would be 240,000. Then

$$\frac{240{,}000 \times 3}{24} = 30{,}000$$

pounds per square inch, which would be an allowable stress, as remarked above.

Or suppose, case (*d*), we wished to know what water level this bulkhead would stand, with stiffeners 2′ 6″ center to center, and 30,000 pounds per square inch maximum fibre stress. Then

$$\frac{R\ S}{W} = \frac{30{,}000 \times 24}{2.5} = 288{,}000 = B.$$

And following the curve for $B = 288{,}000$ to the point where the length of the stiffener is 14′ 4″, we find a corresponding water level of 13′ 4″ above the point taken as the top of the stiffener, or above the point A in Fig. 2.

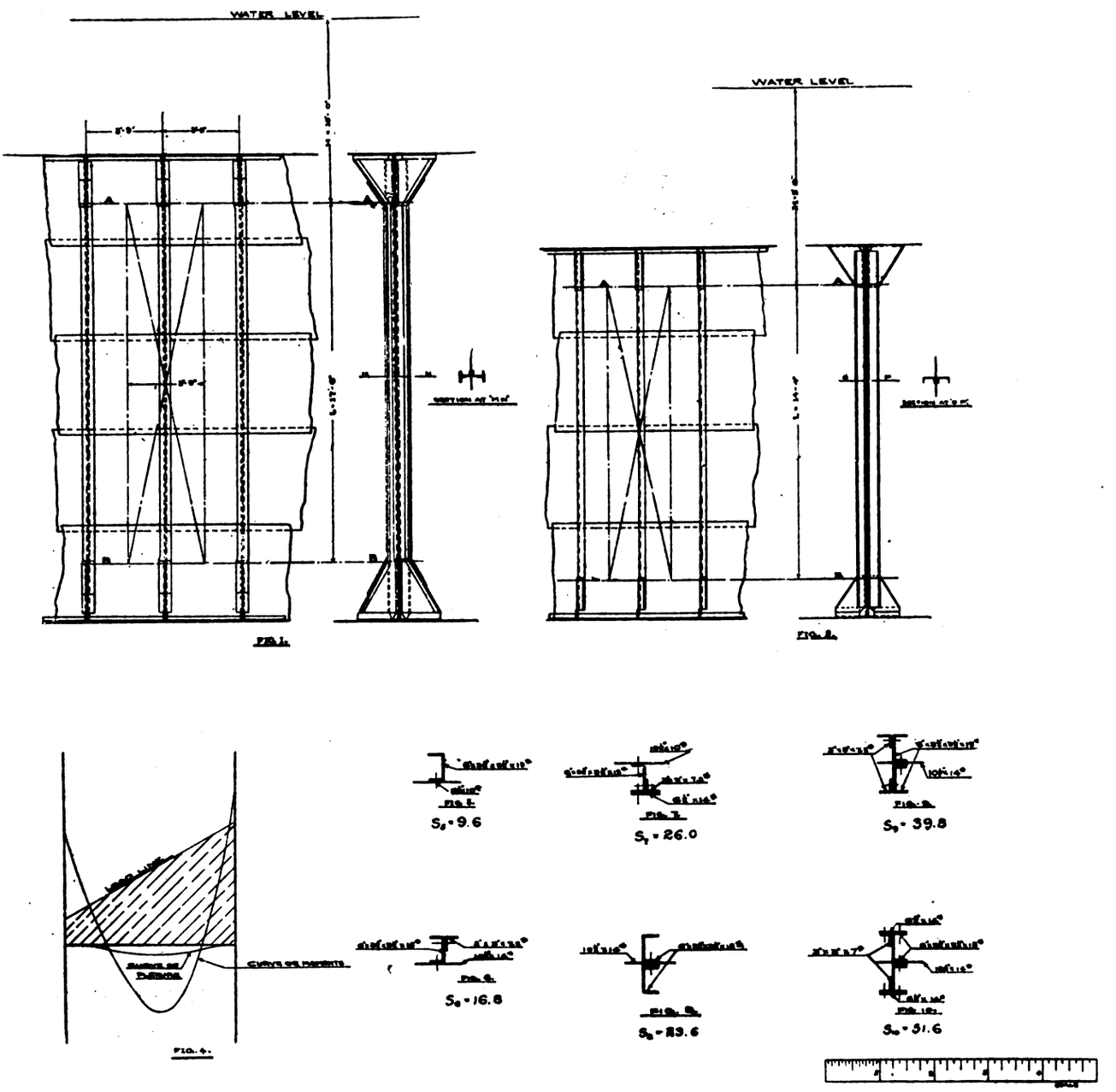
Or suppose, case (*e*), for the above conditions and a water level of 9′ 8″ above the top of stiffener, we wish to know the greatest length of stiffener we may have. Then *B* will equal 288,000 as before, and following the curve to the point where the water level is 9′ 8″ above the top of stiffener, we find a corresponding length of 15′ 5″.

Or suppose, case (*e*), we wish to know the greatest allowable length of stiffener for a water level of 9′ 8″ over this bulkhead with a 3′ spacing, and 25,000 pounds per square inch stress. Then

$$\frac{R\ S}{W} = \frac{25.000 \times 24}{3} = 200{,}000 = B.$$

And the following curve for $B = 200{,}000$ to the point where $H = 9'\ 8''$, we find $L = 13'\ 4''$.

The only quantity left underived, in the above examples, is the section modulus of the stiffener. The late specifica-



tions for battleships and cruisers limit the stiffeners of important water-tight bulkheads to a very few shapes, and combinations of shapes, which are shown in Figs. 5, 6, 7, 8, 9, and 10, with the section modulus for each noted. The method of deriving the section modulus is given in the appendix, both to show the assumptions which have been made for actual use with the curves of Fig. 3, and also for guidance in working out the section moduli of other stiffeners.

The Government specifications require ordinary structural, or "medium" steel, to show an ultimate tensile strength of 60,000 pounds per square inch. It has been found from numerous tests, that with all the assumptions described above, the calculated maximum fibre stress on steel stiffeners conforming to the Government requirements, may be allowed to run up, even as high as 40,000 pounds per square inch, before the stiffener will show signs of having passed the elastic limit. That is, before the deflection will continue to increase if the water pressure is maintained constant, or before the bulkhead will fail to return practically to its original shape when the pressure is removed. Therefore, in designing a bulkhead to stand water test, one may feel fairly safe if the apparent fibre stress in any stiffener, as deduced from the curves of Fig. 4, with the assumptions described, does not exceed 30,000 pounds per square inch. This is considered a fair figure to which to work under ordinary circumstances; but, of course, it is purely a matter of judgment in the light of the conditions surrounding any individual case, as to how nearly the limit may be approached.

Nothing has been said thus far regarding bulkheads stiffened other than vertically. Of course, horizontal stiffeners are frequently worked, and the vertical stiffening is broken by decks and flats.

The usual function of the horizontal stiffeners is merely to break the length of the vertical stiffeners, and the latter may be treated as continuous beams over the horizontal stiffeners; and the portion between any two horizontal stiffeners, or between the last horizontal stiffener and the end connection, may be considered as a beam fixed at the ends and treated by the curves, as described above.

The horizontal stiffeners themselves are merly beams uniformly loaded, or better still, with concentrated loads at the points where they are crossed by the vertical stiffeners, and are readily treated by the ordinary formulae, if necessary.

Much of interest may be said regarding the ability of the plating to carry the load between stiffeners, and a most interesting discussion of this feature is found in Professor Peabody's notes to his students. However, ordinarily the plating is made so thick for purposes of abrasion and corrosion, that it is able to carry the load due to water pressure, with the ordinary stiffener spacing, without difficulty, and is not a matter of concern to one working with this class of bulkhead.

DISCUSSION ON MR. NORTON'S PAPER.

Capt. William Hovgaard:—It appears to me doubtful whether we are justified in considering the double stiffeners used in the United States ships as "fixed at the ends." Already in the paper which Mr. Norton read on this subject at an earlier period he pointed out the discrepancy between the deflection as determined by the formula and that actually observed in the Illinois, and he discussed this matter very fully and in a very interesting manner.

Mr. Norton's conclusion was that by applying the factor to the calculated deflections he would obtain very nearly the observed deflections and that the formula for a stiffener fixed at the ends could be used for finding the stresses.

By tests undertaken in several other battleships and cruisers and which have been analyzed in a thesis work carried out by Assistant Naval Constructors Furer and McBride, when students at the Massachusetts Institute of Technology, it has been found, that the ratio between the observed and calculated maximum deflections varies very considerably in different stiffeners, and that in some cases its value approaches 6. Moreover it has been found that in the same stiffener this ratio is far from constant, but increases very rapidly towards the ends, and the measurements have in no case revealed the existence of points of inflection; if they have existed at all they must have been very close to the brackets. The curve of deflection approached in fact very closely to that for a stiffener freely supported at the ends.

The following table which deals only with maximum deflections and part of which was calculated in the said thesis work, illustrates this point.

New Jersey	1.10 in.	0.19	0.96	5.7
Rhode Island	0.81 in.	0.18	0.93	4.6
Colorado	0.83 in.	0.22	1.14	3.7
Illinois	0.94 in.	0.22	1.11	4.2

I will repeat that I speak here only of double stiffeners, as I have not had an opportunity to study the case of single stiffeners. The great discrepancy which in spite of careful bracketing, is found between the actual results and those that might be expected is, I believe, due to the following causes:

1: Lengthwise (vertical) shearing along the neutral axis at the ends of the stiffener, causing a tendency of the stiffener on one side to move upwards, on the other downwards. This tendency was evidenced by the lifting and buckling of the brackets which took place by the first test carried out on the center line bulkhead of the Illinois as described in naval constructor J. J. Woodward's paper in Volume 6 of the Transactions. When this action occurs the double stiffener will behave more or less as two independent single stiffeners, the bending moment at the apex of the bracket will decrease, while that at the middle will increase and with it the deflection at the middle will increase; the points of inflexion will move towards the ends.

This action should be resisted chiefly by the rivets connecting the flanges of the stiffeners through the bulkhead. But there is only one line of rivets which passes through four thicknesses of steel plus a layer of felt. The shearing stress to which these rivets are exposed may be extremely high (for the case dealt with at foot of page 3 in the paper I found the stress 19 to per square inch).

2: Bodily turning of the double stiffener in a vertical plane round a point near the apex of the brackets; the stiffener behaving to some extent as a beam hinged or freely.

3: Bending of the stiffener due to insufficient stiffness (moment of inertia). This action was exemplified in the second test of the bulkhead in the Illinois described in Mr. Woodward's paper; it occurs even if the stiffener is held perfectly firmly by the brackets, and the bending is of the same nature as that of a flexible string. Such bending will be accompanied by overstraining at the apex of the brackets.

Any and all of these causes may be operative in producing the increased deflection which has been observed, dependent on the construction of brackets and stiffeners in each particular case. It is probable that the action is very complex, and with our present knowledge of the subject I consider it impossible to determine to what extent each of these causes influence the final result.

In spite of the close correspondence which is found between the actual deflections and those calculated by the

formula for a freely supported stiffener, I would therefore not consider it safe to use that formula any more than the one used by Mr. Norton for finding the stresses. I believe it is best to acknowledge our ignorance, and therewith, this necessity for a further minute study of the problem. Only more systematical and refined methods of testing and measurements, than those hitherto used, can reveal what actually takes place in the stiffeners.

In studying the behavior of these double stiffeners, we are naturally lead to inquire into another question, namely, whether the material in such stiffener is used to best advantage. I have already referred to the imperfect connection of the channels through the bulkhead, but the chief objection to this construction is the accumulation of material near the neutral axis. Not only the flanges of the channels but the bulkhead plating itself contribute very little to the moment of inertia. The liners might be avoided by using flush plating as is done in the English ships.

If we make all the stiffeners of same scantlings it appears that there can be no gain in space by double stiffeners as compared with single stiffeners of same total depth. Center line bulkheads may if single stiffeners are used be placed a little out of the center line, by coal bunker bulkheads the stiffeners may face the bunkers and by the transverse bulkheads between engine and boiler rooms the spaces will remain the same as by double stiffeners, if only the stiffeners all face the same way.

It would therefore appear better to place the stiffeners wholly on one side of the bulkhead, whereby the bulkhead plating may be made to serve as one of the flanges, and may then contribute enormously to the moment of inertia, In such case the connection of the stiffener to the bulkhead should be by two flanges each large enough to take a double line of staggered riveting so as to prevent the plating tearing from the stiffeners when the water pressure is applied from the side of the stiffeners.

Whether single or double stiffeners are used it appears doubtful whether the perfectly uniform distribution of stiffeners now used in the United States ships is the best. By tests of bulkheads it has been observed that the stiffeners nearest the ends of the bulkheads take a much smaller deflection than those nearer the middle, a fact which was pointed out already by Naval Constructor J. J. Woodward in this paper above referred to. This can only be explained by the support which the stiffeners get through the bulkhead plating from the adjacent rigid boundary. It shows that such stiffeners might without danger be lightened and that it is possible to construct the stiffening system of a large bulkhead of a limited number of very deep main stiffeners spaced at intervals of much lighter scantlings. This is the system used in the English navy. It is about 25 percent lighter than the American system.

If with this system the internal arrangements permit placing the main stiffeners wholly on one side, they may for a given section modulus be constructed much lighter than the double stiffeners, since the web may be lightened by holes; the depth can without difficulty be tapered off towards the top, and the bulkhead plating comes to form an integrating part of the stiffener. I believe therefore, that in this way we may effect a considerable saving in weight.

Mr. F. L. Fernald:—All I want to say is to commend what Capt. Hovgaard has said to call attention to the mean factors in the paper, wherein it would be very dangerous to use this formula which Mr. Norton has produced of the curves because they are based on beams fast at the end and actual experience shows they are a great deal more rigid than those supported, and it therefore contributes much more to the bulkhead to have the beams secured at the ends. For instance in the case of the New Jersey, where beams were secured at the ends, the calculated deflection was considered within 15 percent of the actual deflection observed, whereas in the Illinois where the upper bracket is secured to the deck rather than to girders and therefore does not have as much tendency to get out of line there the observed deflection was 25 percent. The similarity of the calculated deflection shows that the mean lies somewhere between one supported and one fast at the ends and so we may conclude that to secure the ends of the beams is exceedingly improper. If all the strength of those stiffeners is necessary Mr. Norton has given his minimum of inertia of stiffeners, he has made a rather unfortunate error in figures by taking the thickness between; that is the entire thickness of the plate instead of half the thickness. I have figured that out rather hurriedly, and find that it should give us 129 inside and by carrying that through to the section that would make about 5 percent in addition. It seems to me in the interest of accuracy the correct figures should be substituted there in order to put the paper on the proper basis.

The chairman:—The Chair observes that while there is some force in the remarks of the speaker with reference to the technical part of this paper, still there are very practical points involved. It has recalled a conversation which took place between former chief engineer Melville and myself wherein he remarked that in a set of tracings for naval vessels instead of making lines with drawing pens to represent bulkheads that they should really be represented by large black bands and I pointed out to him that under the English method the black bands would be 24 inches wide. And then they would indicate the clearance available for machinery, boilers and repair shop.

Mr. Norton:—I am very glad to have the error on page 8 pointed out, because I might have explained that these were rather hurriedly made figures and as they agreed very closely with some other figures I had made before I therefore thought they were correct. I there made some errors which we can of course correct before the paper enters the book of the Society.

About the deflections, I have only to say that these curves which have been drawn by Capt. Hovgaard do not appear to agree with the curves observed in the Illinois. We were convinced by the Illinois that the stiffeners did not need to be fast at the end for the very reason that the observed curves have this character (indicating on board) instead of this way. Also because when the brackets gave way they came away up between, along the middle, as though the brackets were doing their very best to fasten the beams at the end.

In the work we have done at Newport News, the bulkheads figured in this model have set the pace, and that is what we are having more than anything else. And the whole idea of getting up this paper was to show what we have used in practice. We are aware that there is a question, in case of a serious outside rupture, about the ability of the brackets to fasten the beams at the end. Of course a great deal may be said regarding the remarks made that it is very improper to arrange the brackets at the ends so they would hold the beams. That can only be manifest after, but that seems to be the very thing to do. To do that demands an arrangement of the brackets to connect the brackets at the ends of the stiffeners to proper support, and then figuring the stiffeners fastened to beams fast at the ends. As a matter of fact that is just what will suffice to better the construction, to provide

brackets all along the bottom fastened to deck brackets and to the foot of these bulkheads. Another point of interest was that one brought up by Capt. Hovgaart about the stiffeners next to the adjacent bulkhead ends. The specifications provide for that by allowing the fastening bolts to be omitted and the stiffeners placed next to adjacent bulkheads. And the objection to top girders in that long space is exactly the thing which has been remarked by the Chairman that the bulkhead stiffeners placed in that way require the boilers and machinery to be kept so far away from it.

About the matter of double stiffeners and single stiffeners on one side of the bulkhead, it is rather interesting to note figures 7 and 8. Figure 7 is the stiffener on one side of the bulkhead and figure 8 is made with the stiffener on each side of the bulkhead, and it is noted that the section modular is figured about the same, and it will be noticed that the stiffeners, as in some cases first built, the stiffeners to one side of the bulkhead take up almost the same without an additional channel on the other side of the bulkhead. So while it may be that that would add largely to the moment of inertia it appears it does not make very much difference to the section modulars and the section modular, after all, is the thing that counts.

The amount of deflection observed in these bulkheads, it has always seemed to me that that was to be explained by the way they are built. The stiffeners being built, are not all of one piece and stiffeners are not different from anything else, and we could not expect to rivet a number of things together without having some internal stress and that appears as soon as the pressure is put on the bulkhead, and it seems to me these internal stresses appear by their doing just as an oil can, pressing out on one side or the other as soon as pressure is put on it.

Of course another thing to be considered is additional refinement in the calculations. That does not seem to me to help us very much. The principal thing is to think out the lines of action of the various stiffeners and brackets, because the additional refinement in figures does not help us any for the simple reason that the bulkheads and stiffeners are not refined themselves, but they are all rough, and they do not act as one solid piece. Perhaps a beam does act merely as a supported beam or partly as a beam fastened at the end, and for that reason it is not additional refinement in figures that is required, but additional judgment used in preparing supports for the brackets at the end and properly designing the stiffeners and deciding just how they do act.

MARINE ENGINEERS' BENEFICIAL ASSOCIATION.

Lake delegates of the Marine Engineers' Beneficial Association are holding a meeting in Buffalo during the present week preparatory to the annual meeting which opens in Washington on Jan. 22. The meeting will be quite an important one and a schedule of wages for the next season will be adopted. It is understood that the engineers are quite well satisfied and no important changes in the schedule are contemplated. It is likely, however, that certain recommendations will be made concerning the safety of crews aboard ships. It has been suggested that a safe passage from bow to stern be constructed. In the case of the Sevona lives were lost because a portion of the crew could not reach the after end, while in that of the Mataafa lives were lost because they could not reach the forward end of the ship.

A revised chart in colors of Thunder Bay, Lake Huron, has just been issued by the United States Lake Survey and is now for sale by the MARINE REVIEW.

THE MENOMINEE IRON RANGE.*

BY JOHN L. BUELL.

It is not generally known that a tradition exists among the Menominee Indians (who were the only inhabitants of this range prior to the discovery of iron ore), that if any member of the tribe should disclose to a white man the existence of a mineral deposit, his speedy death was sure to follow. This superstition may have influenced the lateness of the mines' discovery, and of their subsequent operation on this range; for by bringing specimens (which could be readily obtained) to the trading posts, they would have incited earlier investigation. Be that as it may, it is incomprehensible why the existence of ore deposits in such vast quantity should have remained unknown for so many years.

Another embarrassment, and one of more substantial import, was the impression that iron ore of quality and quantity could exist only in the Marquette range. The geological formation of other districts, where indications of ore were prevalent, but not corresponding exactly with those of the Marquette district, seemed to preclude the possibility of the existence of paying ore. This impression was general, and was so effective as to influence the most active and noted explorers, among whom may be included such men as Credner, Pumpelly and Brooks.

Dr. Credner, as State geologist, ventured so far as to publish in his report the existence of a large deposit of highly silicious iron ore on Section 11, 39-29. Brooks and Pumpelly, with John Armstrong as guide and woodsman, traversed every section of the lower range, when making the selection of lands for the canal company. They did no little digging, both on this and on the Metropolitan range, but in no instance did they find any deposits of standard ore, certainly none which they ever disclosed. The edict had gone forth: "There was no good ore outside of Marquette county," and, blinded with this phantasm they strolled aimlessly over locations from which millions of dollars' worth of ore have since been extracted and millions more are yet to come.

This country of Menominee, also, was made for a purpose. These iron ranges have shown a striking example of rapid development. This is especially true of the lower Menominee range and the Iron river, Crystal Falls, Gogebic and Minnesota districts; ore has been disclosed over a territory, the value of which a short time previous, if it had any, was based solely upon the pine timber standing thereon.

The location of this district, remote from water and rail transportation, the reported severity of its climate, as also the reported barenness of its soil, all tended to divert immigrants. Saw-logs and saw-mills were the only products shipped from the Menominee and its tributaries. The first 75,000 of pine logs cut on the Menominee, above lower Quinnesec Falls, was hauled by the New York Lumber Co. in the winter of 1870 and 1871, from the little point of land where the outlet of lake Fumee flows into the main river (Section 3, 39-30).

The first exploring party to enter the territory embracing the lower Menominee range, was headed by N. P. Hulst, of Milwaukee. As a representative of the Milwaukee Iron Co., he began explorations on Section 10, 39-29, in the summer of 1872. The exploration was not confined to this point, but extended elsewhere, consisting of test-pitting and trenching, with the exception of a long drift across the silicious formation on Section 10. The exploration was discontinued in the fall of that year.

In the fall of 1871, the writer, in company with John Armstrong, encamped at the little spring on the present site of the village of Quinnesec. While Armstrong was preparing dinner, a little stroll over the bluff to the west disclosed to me the out-cropping of the easterly terminus of the Quinnesec mine formation. It was not until the spring of 1873 that

*Abstract of a paper read before the Lake Superior Mining Institute, October, 1895.

the title to this tract was restored. In May, exploration was begun and prosecuted until a deposit of the blue ore was discovered on Aug. 3, in the same year.

When the ore was first struck, it had a width of 11 ft. of clean ore; a jasper horse, 4 ft. in width; and then 1 ft. more of clean ore. 75 ft. east, the deposit had a width of 33 ft., with 66 per cent iron, 4 per cent silicon, and 0.013 per cent phosphorus.

In the spring and summer of 1874, 55 tons of this iron ore was hauled to Menominee on sleds and wagons, and smelted in the furnace at that point, with a mixture of hard ore from Jackson and Winthrop. The last furnace charge consisted entirely of the Menominee range ore, thus establishing its tractability. Robert Jackson, superintendent of the furnace, spoke in the highest terms of the quality of the ore. This was practically the first test of standard ore from the Menominee range, and it was the incentive to rapid and successful exploration along the entire formation.

Mines were discovered from 1872 onward. Norway, Cyclops, Curry, Saginaw, Stephenson, were the finds in 1878. Breen was found in 1872; and then explored and operated by the Menominee Mining Co., of which Dr. Hulst was manager. Vulcan was a product of 1873, though it did not ship until 1877. Quinnesec was of 1877, as was Emmet. In 1879 came the great Chapin, East Vulcan. Cornell, Keel Ridge, and Indiana. Millie came in 1880. To these should be added the subsequent and recent discoveries of Pewabic, Aragon, Loretto, Munroe, Traders, Walpole, Vivian and Cundy. Of the foregoing, Keel Ridge, Cornell, Indiana, Quinnesec, Cyclops, Emmet and Stephenson are apparently worked out and abandoned. The Indiana has closed on account of excessive water, and the Cundy is temporarily idle. Saginaw and Breen are being re-opened; Hamilton and Ludington have been merged with the Chapin; and Curry, with the West Vulcan.

Below is given the estimated product of each mine for the year 1905, and the force at present employed at each:

Mines.	Tons.	Men.
Chapin	972,000	900
Pewabic, Walpole	530,000	533
Traders	150,000	80
Vivian	95,000	100
Munroe	100,000	90
Aragon	430,000	570
Vulcan, E. Vulcan	425,000	650
Loretto	94,000	174

This makes a total product for the year 1905 of 2,796,000 tons, with a force of about 3,000 employes.

The product is keeping up to, it not exceeding, former years, with the number of employes somewhat reduced, because of the application of improved machinery, underground haulage and improved methods of mining. The quality of the ore produced is not so good as in former years, yet all finds a ready market and no complaints are heard from the operating corporations. The scale of wages is as high as, if not higher than, ever before on the range. This standard of pay, in the face of reduced value of ore, is maintained only by the use of improved machinery and by skillful management in the raising and shipping of the product.

It is estimated that the ore is now delivered on cars at some of the mines at a cost of 60 per cent less than in former years. When ore was worth from $8 to $12 per ton, the operator could afford to be somewhat indifferent as to the cost of production; but with a price of $4 at the end of the market, it behooves the management to exercise the utmost economy and skill in the operation of the mine.

The Chapin, by far the heaviest producer on the range, has underground electric haulage, and shows a total product up to Jan 1, 1905 (Hamilton and Ludington included) of 13,599,378 gross tons. It was discovered in 1879 and made its first shipment in 1880. Since that date, with the exception of 1892 and 1893, it has been a constant and heavy producer. The ore body consists of a series of lenses extending easterly and westerly 6,100 ft., with a varying width of from 50 to 150 ft. The greatest depth reached in the mine is 1,460 ft. The standard ore is worked out down to the eleventh level, a distance of 860 ft; yet large bodies remain much nearer the surface. The caving-process has been used in this mine, making it much more secure against accidents, and permitting the extraction of all the ore at a much less cost than under the old system. Under a pressing demand, 1,000,000 tons could be raised annually throught the Hamilton shaft alone. The immense body of ore in sight indicates many years of heavy production.

Exploration on this range for the past few years has been quite general, with little success. The question of formation is a perplexing one. Many theories are advanced, and each explorer seems to have his own. All seem to conclude that, when limestone (so-called) is reached, it is useless to prosecute the investigation further. This in the face of the fact, that all deposits of the standard blue-ore on the ranges are in the direct longitudinal trend of the limestone—*in* the limestone, not alongside of it. I know of no diamond-drill which has ever been placed on the range with a view to penetrating the formation immediately north of the lime-rock. They all drill away from it. Not until the limestone (with a width of four miles and a length of from 18 to 20) shall have been thoroughly cut with the drill, can anyone say that the lower range has been thoroughly explored. With the immense deposit of ore at the Pewabic between two beds of limestone; with the Walpole in the midst of it; with the Quinnesec, Norway, Saginaw and Cyclops, and portions of the Aragon in the direct trend of an immense deposit of limestone, who can deny the plausibility of looking for standard ore *in* the limestone, and not alongside of it?

The corporations engaged in mining on the range at the present date consist of the Oliver Iron Mining Co., operating the Chapin, Aragon and Cundy mines; the Pewabic, operating the Pewabic and Walpole mines; the Mineral Mining Co., operating the Breen and Nanaimo mines; the Penn Co., operating the Vulcan properties; the Buffalo & Susquehanna Co., operating the Munroe; the Antoine Ore Co.; the Loretto Iron Co.; and Pickands, Mather & Co., operating the Vivian. This comprises all the companies engaged in mining operations at the present date on the Lower Menominee iron range.

It is in order at this point to touch briefly on another enterprise incidental to the iron ore interest. Within the range, or accessory to it, are seven great water powers; the two Twin Falls, the Horse Race, the Upper and Lower Quinnesec, Sand Portage, and Sturgeon Falls. Four of these are unoccupied and the immense power at hand is going to waste. The Upper Quinnesec has been for many years occupied by a large compressor plant, the air from which is used for mining purposes by the Chapin. The Lower Quinnesec operates one of the largest paper-and-pulp mills in the country. At Sturgeon Falls, the Penn Iron Co. has recently begun the construction of an electric plant to supply power for its mines.

Notwithstanding that the existence of ore in shipping quantity was fully demonstrated in 1874, and notwithstanding the heavy demand for lumbering supplies (which at that time were hauled on wagons from Menominee), it was not until 1877 that the Menominee River railroad was completed to Quinnesec. In 1880 the road was extended to Iron Mountain, and thence to Iron river, Crystal Falls and the Gogebic range. The delay in the construction of the road as far as Quinnesec arose from a matter of doubt on the part of capitalists as to whether this range would sustain a railroad costing $475,000. The road paid for its construction in its first year; and this little stretch of railroad from Iron Mountain to Escanaba since it began operations, has paid for many hundreds of miles of track on the western prairie. We have now three railroads

penetrating the range; the Chicago & Northwestern; Chicago, Milwaukee & St. Paul, and the Wisconsin & Michigan. All are doing an ore-carrying business; this, with the other traffic incidental to the operation of our mines and the development of a comparatively new country, provides ample business both in passenger and freight traffic.

ITEMS OF GENERAL INTEREST.

The Board of Supervising Inspectors of Steam Vessels is in session at Washington.

The Harlan & Hollingsworth Co., Wilmington, Del., has secured an order for two tug boats for the Central Railroad of New Jersey.

Wooden ship building in Maine has suffered a decline during the past year of a total of 13,771 tons, as compared with 4,492 tons in 1904.

The lighthouse board will open bids on Feb. 1, for the construction of the new lighthouse tender Cypress. The estimated cost of the new tender is $80,000.

The Baltimore Ship Building Co., Baltimore, Md., will make repairs amounting to about $7,500 on the German steamer Regina.

The Sharptown Marine Railway, Sharptown, Md. has received an order from the P. Dougherty Co., of Baltimore for a barge 175 ft. long, 30 ft. beam and 14 ft. deep.

MacPherson, Willard & Co., Bordentown, N. J., shipped a 52,000-lb. stern post, the largest forging ever made at that yard for a steamship, to Cramp's, Philadelphia, for use on one of the vessels which that company is building for the Southern Pacific Co.

C. F. Brown, Pulpit Harbor, North Haven, Me., are building an auxiliary sloop for H. J. Morse, 18 Wall St., New York, 52 ft. long, equipped with a Lozier 15 H. P. gasoline engines, 15 gross tons capacity, to cost $5,000.

Peter Swanson, Belvidere, Cal., is building a flush deck wooden launch for E. Pond, of San Francisco, to be 48 ft. long over all, equipped with a gasoline engine of 15 H. P., gross tonnage 14, to cost $5,000; also a wooden cabin launch for H. W. & N. E. Meek of Hayward, Cal., to be 33 ft. long over all, equipped with a gasoline engine of 15 H. P., to cost $2,000. Wooden open speed launch for C. H. Crocker, San Francisco, to be 33 ft. long, equipped with a gasoline engine of 40 H. P., costing $2,000. Open launch for Mr. Screiber, Inverness, Cal., 32 ft. long, equipped with a gasoline engine of 12 H. P., to cost $1,200.

The bid of the Lockwood Manufacturing Co., East Boston, Mass. of $2,909.47 has been accepted for repairing the lighthouse tender Mayflower and the bid of the Ollinger & Bruce Dock Co., Mobile, Ala. for $1,354.70 has been accepted for making repairs to the tender Mangrove.

The Mobile Railway Co., Mobile, Ala. has received a contract to repair the lighthouse tender Laurel for $1,255 and the Southern Marine Works, New Orleans, will repair the lighthouse tender Magnolia for $13,000.

It has been decided to raise a fund in memory of the late Archibald P. Head, who met his death in the "Twentieth Century Limited" train in America. For this purpose a small committee, with Sir Alexander B. W. Kennedy as chairman, has been formed to raise a fund to establish a gold medal or scholarship in connection with the engineering department, University College, London. As there are, no doubt, a number of friends and old college fellow-students of the late Archibald P. Head whose present addresses the committee have not been able to obtain, but who would be glad to avail themselves of the opportunity of doing something to perpetuate Mr. Head's memory if they knew what was being done, it is advisable to say, that contributions may be sent to either the treasurer, Mr. C. T. Millis, Borough Polytechnic, London, S. E., or direct to Messrs. Hoare, bankers, 37, Fleet street, for the "Archibald P. Head Memorial Fund account."

Stearns & McKay, Marblehead, Mass., report that they are quite busy getting out a cabin gasoline launch for W. V. Taylor, Boston Globe, Boston, Mass., to be 28 ft. long over all, equipped with twin screw Jager gasoline motor, 18 H. P. to cost $2,300. Also a cabin gasoline launch for the Carnegie Institution of Washington for Dry Fortuga station to be 28 ft. long over all, equipped with twin screw Globe gasoline motor 16½ H. P. to cost $2,200. Open gasoline launch, 33 ft. over all, equipped with single screw 12 H. P. Standard motor for Franklin Dexter of Boston, to cost $2,200. Cabin gasoline launch, 28 ft. long over all, for W. H. Nimick of Pittsburg, to be equipped with a twin screw Buffalo motor, 15 to 18 H. P., to cost $2,300. Cabin gasoline launch for Lyman Sise of Needford, Mass., 28½ ft. over all, single screw Mietz & Weiss oil engine, 7 to 10 H. P., to cost $1,000. Open launch for the Eastern Yacht Club, Marblehead, Mass., to be 23 ft. long, to cost $1,400.

TRADE NOTES.

Kahnweiler's Sons, manufacturers of life preservers, metallic life boats and rafts, have put out some attractive calendars advertising their product.

The Otis Elevator Co. has just sent out with its compliments a book entitled, "Views of New York," giving over 400 illustrations of the principal buildings in that city. It is an extremely interesting and valuable work.

The National Electric Co., Milwaukee, Wis., has just put out a little card illustrating the type N motor which they build in all sizes. They are manufacturers of electrical machinery in all capacities for lighting, power and railway services and are also makers of the Christensen air brakes.

The Atlantic Works, Inc., 28th street and Gray's Ferry Road, Philadelphia, Pa., has recently received an order for one of their B-17 adjustable bevel band saw machines from the Central Railroad of New Jersey, to be used in their boat yard at Jersey City, N. J.

The Upson-Walton Co., Cleveland, O., is sending out a picture in colors of a pretty girl named Grace, as its 1906 souvenier. It is a direct reproduction of an oil painting by Galli, and is very well done. The Upson-Walton Co. notes that it has secured only enough copies of this painting to supply their actual mailing list of customers, and are therefore compelled to say to art dealers, and those not on their list, that they have made arrangements with their publisher to supply the print at $1 per copy.

The Day dough mixer, manufactured by the J. H. Day Co., Harrison, Ave. & Bogen St., Cincinnati, O., has been installed upon the following vessels of the United States navy: Battleships Wisconsin, Ohio, Georgia, Vermont, Illinois, Kansas, Maine, Kearsarge, Kentucky, Alabama, Rhode Island, New Jersey, Nebraska; armored cruisers Washington, Tennessee, South Dakota, California, Pennsylvania, West Virginia, Colorado; protected cruisers Charleston, St. Louis and Milwaukee; receiving ship Franklin; transport Lawton.

Judgment as to the crowning type of feminine loveliness in calendars must always be reserved until J. U. Karr, dealer in general ship supplies, 169-171 River street, Cleveland, is heard from. Last year he put out a calendar which prompted a connoisseur to say that it was sufficient to tittilate the jaded epicureanism of the most artistic palate. This year Mr. Karr has plunged the artistic contingent into a serious dilemma since he has put out two calendars of rare beauty. They must be dismissed with the assurance that one could be happy with either were t'other dear charmer away.

Buyers' Directory of the Marine Trade

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by The Marine Review, Cleveland.

See accompanying index of Advertisers for full addresses of concerns in this directory.

AIR COMPRESSORS, AIR HOISTS, ETC.
Great Lakes Engineering Works.....Detroit.
Mietz, Aug. .....New York.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.

ANCHORS.
Bowers, L. M. & Co.....Binghamton, N. Y.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons.....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit
Great Lakes Engineering Works.....Detroit
Sturtevant, B. F., Co.....Hyde Park, Mass.

ASH EJECTORS.
Great Lakes Engineering Works.....Detroit.

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
Jenkins, Russell & Eichelberger....Cleveland.
Kremer, C. E.....Chicago.
MacDonald, Ray G.....Chicago.
Shaw, Warren, Cady & Oakes.....Detroit.
White, Johnson, McCaslin & Cannon Cleveland

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.....Brookline, Mass.

BELTING (LEATHER).
Republic Belting & Supply Co.....Cleveland.

BLOCKS, SHEAVES, ETC.
Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.

BLOWERS.
Power Specialty Co.....Detroit.
Sturtevant, B. F. Co.....Hyde Park, Mass.

BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, David.....New York.
Lane & DeGroot....Long Island City, N. Y.
Marine Construction & D. D. Co.....
.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

BOILER CLEANING DEVICE.
Power Specialty Co.....Detroit.

BOILER COMPOUNDS.
The Bird-Archer Co.....New York
Dearborn Drug & Chemical Works....Chicago.

BOILER MANUFACTURERS.
Almy Water Tube Boiler Co..Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Detroit Ship Building Co.....Detroit.
East End Boiler Works.....Detroit.
Fletcher, W. A. & Co.....Hoboken, N. J.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Works....
.....Oswego, N. Y.
Marine Iron Works.....Chicago.
Maryland Steel Co.....Sparrows Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher Water Tube Boiler Co....New York.
Newport News Ship Building Co.....
.....Newport News, Va.

BOILER MANUFACTURERS—Continued.
New York Shipbuilding Co.....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co....
.....Duluth, Minn.
Quintard Iron Works Co.....New York.
Roberts Safety Water Tube Boiler Co....
.....New York.
Stirling, The Co.....New York.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co.....Detroit.

BOILER RIVETS.
Bourne-Fuller Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co..Cuyahoga Falls, O.

BRASS AND BRONZE CASTINGS.
Cramp, Wm. & Sons.....Philadelphia.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lunkenheimer Co.....Cincinnati.
Macbeth Iron Co.....Cleveland.

BRIDGES, BUILDERS OF.
Cowing, John P.....Cleveland.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.
Brown Hoisting & Conveying Machine Co.
..... Cleveland.

BULKHEAD DOORS, WATERTIGHT.
"Long Arm" System Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.
Martin-Barriss Co.....Cleveland.

CANVAS SPECIALTIES.
Baker & Co., H. H.....Buffalo.
Bunker, E. A. .....New York.
Upson-Walton Co.....Cleveland.
Republic Belting & Supply Co.....Cleveland.

CAPSTANS.
American Ship Windlass Co..Providence, R. I.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

CEMENT, IRON FOR REPAIRING LEAKS.
Smooth-On Mfg. Co.....Jersey City, N. J.

CHAINS.
Woodhouse Chain Works.....Trenton, N. J.

CHAIN CONVEYORS, HOISTS.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.
General Electric Co.....Schenectady, N. Y.

CHAIN HOISTS.
Boston & Lockport Block Co....Boston, Mass.

CHARTS.
Penton Publishing Co.....Cleveland.
Potter, J. D.....London.

CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.

COAL AND ORE HANDLING MACHINERY.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.

COMPASSES.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS CORRECTORS.
How, Benj. V..... Boston

CONDENSERS.
Great Lakes Engineering Works.....Detroit.
Thropp & Sons Co., John E...Trenton, N. J.

CONTRACTORS FOR PUBLIC WORKS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Great Lakes Dredge & Dock Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Hubbell Co., H. W.....Saginaw, Mich.
Lake Superior Contracting & Dredging Co.,
..... Duluth, Minn.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

CORDAGE.
Baker & Co., H. H.....Buffalo.
Upson-Walton Co.....Cleveland.

CORK JACKETS AND RINGS.
Armstrong Cork Co.....Pittsburg, Pa.
Kahnweiler's Sons, D.....New York.

CRANES, TRAVELING.
Brown Hoisting Machinery Co.....Cleveland.

DIVING APPARATUS.
Morse, A. J. & Son.....Boston.
Schrader's Son, Inc., A..... New York.

DRAFT, MECHANICAL.
Sturtevant Co., B. F.....Hyde Park, Mass

DREDGING CONTRACTORS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
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Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

DREDGING MACHINERY.
Quintard Iron Works Co.....New York.

DRYING APPARATUS.
Sturtevant, B. F. Co.....Hyde Park, Mass.

DRY DOCKS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.....
.....Newport News, Va.
Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co....Superior, Wis.
Tietjen & Lang Dry Dock Co.....Hoboken, N. J

DREDGE BUILDERS.
Manitowoc Dry Dock Co.....Manitowoc, Wis.

DYNAMOS.
General Electric Co.....Schenectady, N. Y
Mietz, Aug. .....New York.
Sturtevant, B. F. & Co.....Hyde Park, Mass.
Thropp & Sons, John E.....Trenton, N. J.

ECONOMIZERS, FUEL.
Sturtevant Co., B. F.....Hyde Park, Mass.

ELECTRIC HOISTS AND CRANES.
General Electric Co.....Schenectady, N. Y.

WANTED and FOR SALE Department.

PROPOSALS.

PROPOSALS FOR TWO SNAGBOATS.—U. S. Engineer Office, Vicksburg, Miss , Jan. 8, 1906. Sealed proposals, in triplicate, for construction and delivery of two steel snagboats will be received here until 12 noon, standard time, March 10, 1906, and then publicly opened. Information furnished on application. G. M. Hoffman, Capt. Engineers.

FOR SALE.

SPECIAL

Bargain Prices if sold by February 1st.

I have for sale the Wooden Package Freight Steamers, John G. Gault and Russell Sage. They will cut down into good lumber boats. Hulls 218 ft long, 33 ft. beam and 13 ft. deep. Engines steeple compound, 24″-54″ x 36″. Two fire box boilers 7 ft. x 14 ft.

Tug Wanted—16″ x 18″ or 18″ x 18″, good condition. Address,

GEO. E. HARDIE,

1909 Superior St., Toledo, O.

FOR SALE.

FOR SALE.

One combination Clamshell and Dipper Dredge. Machinery for clamshell dredge. A dipper dredge partly burned. Deck scow 112 x 32 x 9. Tug—14 x 16. Several dredge dippers. Three 100-yd. dump scows. Miscellaneous appliances. Office with safe and fixtures, all to be closed out cheap.

CARKIN, STICKNEY & CRAM.
DETROIT, MICH.

Steam Barge for Sale.

For Sale.—Steam barge, 131 ft. keel, 25 ft. beam, 9 ft. deep. Capacity, lumber, 260 M ft.; coal, 400 tons. Good power; can handle two or three barges. Everything pertaining to this boat is in good condition. Terms cash. Address Lock Box 35, St. Clair, Mich.

For Sale

Steamer Oregon lying in Milwaukee; Length of keel, 197 ft.; beam, 33 ft.; depth of hold, 13 ft. 9 in. Built in 1892, rebuilt 1903. Registered tonnage, 779 gross, 557 net. Boiler built in 1887, M. Riter, Buffalo, 16 ft. long, 120 inches diameter, allowed 100 pounds steam. Engine steeple compound, 20 x 40, 32 inch stroke. Capacity, lumber average 735 M ft.; wheat, 41,000; hard coal, 1200; soft coal, 1150; ore, 1100. J. A. CALBICK & CO., 44-2 Sherman St., Chicago, Ill.

FOR SALE.

Marine Engine

FOR SALE,—One fore and aft compound marine engine, 27 cylinders, and 50 x 40. Built by the D. D D. Co. Enquire of THE MONTAGUE IRON WORKS, Montague, Mich.

WANTED.

Tug and Scow.

Canadian bottoms preferred. Small and medium sizes. Give full particulars and best cash prices. Address Box 92 MARINE REVIEW, Cleveland, O.

BOILER WANTED.

Good second-hand boiler, one that has not been used very long and is in good condition, about 9 or 10 ft. long and 4½ or 5 ft. in diameter. Address DORMER BOUTEN-FISH CO., Bayfield, Wisconsin.

Dredge Wanted.

Wanted a small dredge that will work in about three feet of water.

THOS. GILLESPIE,
Sturgeon Bay, Wis.

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Buyers' Directory of the Marine Trade.—*Continued.*

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General Electric Co.....Schenectady, N. Y.
Mietz, Aug. .....New York.
Sturtevant, B. F. & Co.....Hyde Park, Mass.
Thropp & Sons, John E.....Trenton, N. J.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Detroit Ship Building Co.....Detroit.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Shipbuilding Co....Quincy, Mass.
Great Lakes Engineering Works.Detroit, Mich.
Hall Bros. .....Philadelphia.
Lockwood Mfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrows Point, Md.
Mietz, Aug.....New York.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher, Chas. D.....New York.
Moulton Steering Engine Co.....New York.
Newport News Ship Building Co.....
.....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co...
..... Duluth, Mich.
Quintard Iron Works Co.....New York.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp, J. E. & Sons Co.....Trenton, N. J.
Trout, H. G.....Buffalo.

ENGINE BUILDERS, STEAM.

Sturtevant Co., B. F.....Hyde Park, Mass.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Marine Mfg. Supply Co.....New York.

ENGINEERING SPECIALTIES AND SUPPLIES.

Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
Northwestern Steam Boiler & Mfg. Co...
..... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.

Hynd, Alexander .....Cleveland.
Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Roelker, H. B. .....New York.
Wood, W. J. .....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Sturtevant, B. F. Co.....Hyde Park, Mass.

FEED WATER PURIFIERS AND HEATERS.

Greacen-Derby Engineering Co.....
.....Perth Amboy, N. J.
Ross Valve Co.....Troy, N. Y.

FIRE EXTINGUISHERS.

Safety Fire Extinguisher Co.....New York.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.

General Electric Co.....Schenectady, N. Y.

FORGES.

Sturtevant, B. F. Co.....Boston.
Sutton Co., C. E.....Toledo, O.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co...Cleveland.
Fore River Shipbuilding Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.

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